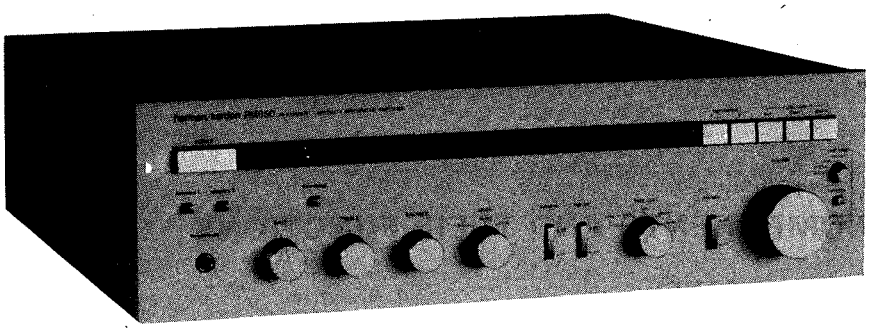
The Harman Kardon Model PM650

Manual No. 22A

HI-CURRENT CAPABILITY INTEGRATED AMPLIFIER

Technical Manual



harman/kardon

240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
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SPECIFICATIONS

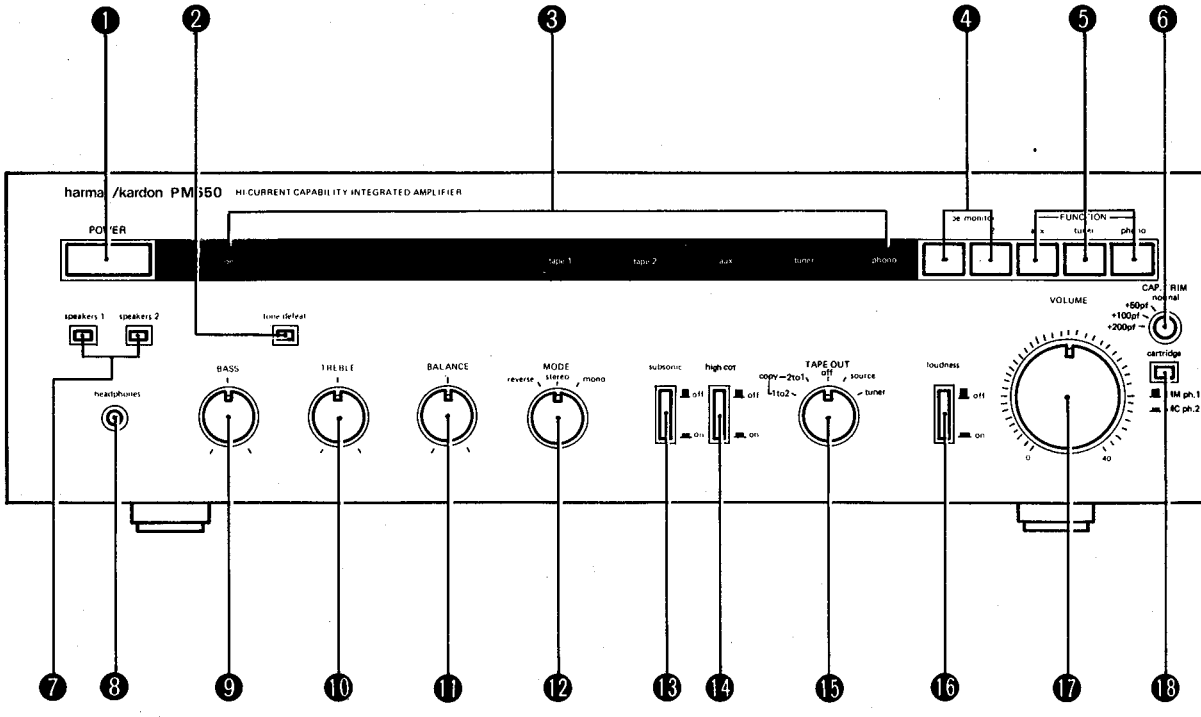
R.M.S. Power Output: 50W+50W at 0.08% T.H.D. (8Ω)
Frequency Response (–3dB): 0.5Hz ∿140kHz
IM Distortion: Less than 0.1%
Slew Rate: 100V/μsec.
Overall Negative Feedback: 15dB
S/N (IHF-A) Phono: 78dB
AUX: 80dB
Phono Overload MM: More than 220mV at 1kHz
MC: More than 5mV at 1kHz

Semiconductors: 83 Transistors, 2 FETs,
8 Diodes, 17 Zener Diodes,
3 Bridge Silicon Diodes,
2 Varistors
Power Supply: AC 120V, 60Hz
Power Consumption: 350W, 390VA
Dimensions: 440(W) x 122(H) x 360(D)mm
(17-5/16" x 4-13/16" x 14-3/16")
Weight: 10.4kg. (30lbs. 13oz.)

Specifications and components subject to change without notice.
Overall performance will be maintained or improved.

COMPONENTS AND THEIR FUNCTIONS

■ FRONT PANEL



❶ POWER SWITCH (POWER)
For power on and off.
When this switch is pressed after AC cord connection to an outlet, the DISPLAY PANEL indicates "on" in red color. Press this switch again to turn the power off.

❷ TONE DEFEAT SWITCH (tone defeat)
For defeating tone control by TONE CONTROL knobs (BASS, TREBLE).
At the depressed position, flat frequency characteristic is obtained irrespective of TONE CONTROL knob positions.

❸ DISPLAY PANEL
(on / tape 1 / tape 2 / aux / tuner / phono)
The DISPLAY PANEL indicates the current status of the unit.

❹ TAPE MONITOR SWITCHES (tape monitor 1,2)
For monitoring the equalizer or tape deck connected to the TAPE 1 INPUT/OUTPUT jacks or TAPE 2 INPUT/OUTPUT jacks.
The monitored tape deck is displayed as "tape 1" or "tape 2" in red color on the DISPLAY panel.

❺ FUNCTION SELECTORS (FUNCTION)
AUX switch:
Press this switch to select the program source connected to the AUX INPUT jacks.
TUNER switch:
Press this switch to select the tuner connected to the TUNER INPUT jacks.
PHONO switch:
Press this switch to select the turntable connected to the PHONO INPUT 1 or 2 jacks.
The selected function is indicated as "aux", "tuner" or "phono" in green color on the DISPLAY PANEL.

❻ CAPACITANCE TRIM SELECTOR (CAP. TRIM)
For adjustment of the capacitance of the cartridge of your turntable connected to the PHONO 1 INPUT jacks.
Set this knob as follows:

Cartridge capacitance	Position
0 – 300pF	normal
300 – 350pF	+50pf
350 – 400pF	+100pf
Over 400pF	+200pf

❼ SPEAKER SELECTORS (speakers 1, speakers 2)
For selection of speakers to be sounded.
2 speaker systems can be connected to this unit. When listening to speaker sound, depress the corresponding selector. To sound both speaker systems, depress both switches. Release the switch to listen with headphones only.

❽ STEREO HEADPHONES JACK (headphones)
For connection of stereo headphones.
Output signal is always supplied to this jack.

❾ BASS CONTROL KNOB (BASS)
For emphasis or attenuation of low-pitched tone.
Turn it clockwise for emphasis, or counterclockwise for attenuation.

❿ TREBLE CONTROL KNOB (TREBLE)
For emphasis or attenuation of high-pitched tone.
Turn it clockwise for emphasis, or counterclockwise for attenuation.

⓫ BALANCE CONTROL KNOB (BALANCE)
For balance adjustment between left and right channels.
Normally place it at the center position.

⓬ MODE SELECTOR (MODE)
MONO position:
Select this position for a monaural source program.
STEREO position:
Select this position for stereo playback, reception or recording.
REVERSE position:
Select this position to reverse the right and left channel signals.

⓭ SUBSONIC FILTER SWITCH (subsonic)
For filtering very low frequencies.
When depressed, the subsonic filter is validated to prevent distortion resulting from turntable rumble and speaker damage caused by superlow tones.

⓮ HIGH CUT FILTER SWITCH (high cut)
For attenuation of high frequency noise.
At depressed position, the high cut filter is validated to cut off high frequency noise such as tape hissing sound.

⓯ TAPE OUT SELECTOR (TAPE OUT)
TUNER position:
The tuner signals appear at TAPE 1/2 OUTPUT jacks irrespective of the selected function. This position enables listening to turntable or the source connected to the AUX INPUT jacks while recording a broadcasting program (air check).
SOURCE position:
The signals of the source selected by the FUNCTION selector appear at the TAPE 1/2 OUTPUT jacks.
OFF position:
During tape playback or listening to a program source selected by the FUNCTION selector, the output signals to the TAPE 1/2 OUTPUT jacks are cut off to prevent sound degradation.
COPY–2 TO 1 position:
Enables dubbing from the tape deck connected to TAPE 2 INPUT jacks to the deck connected to TAPE 1 OUTPUT jacks.
To monitor the source tape sound, press the TAPE MONITOR 2 switch. To monitor the sound being recorded, press the TAPE MONITOR 1 switch.
When the FUNCTION switch (AUX, TUNER or PHONO) is pressed with the TAPE MONITOR switches OFF, you can enjoy the selected source sound while copying the tape (dubbing).
COPY–1 TO 2 position:
Reverse of the above position.

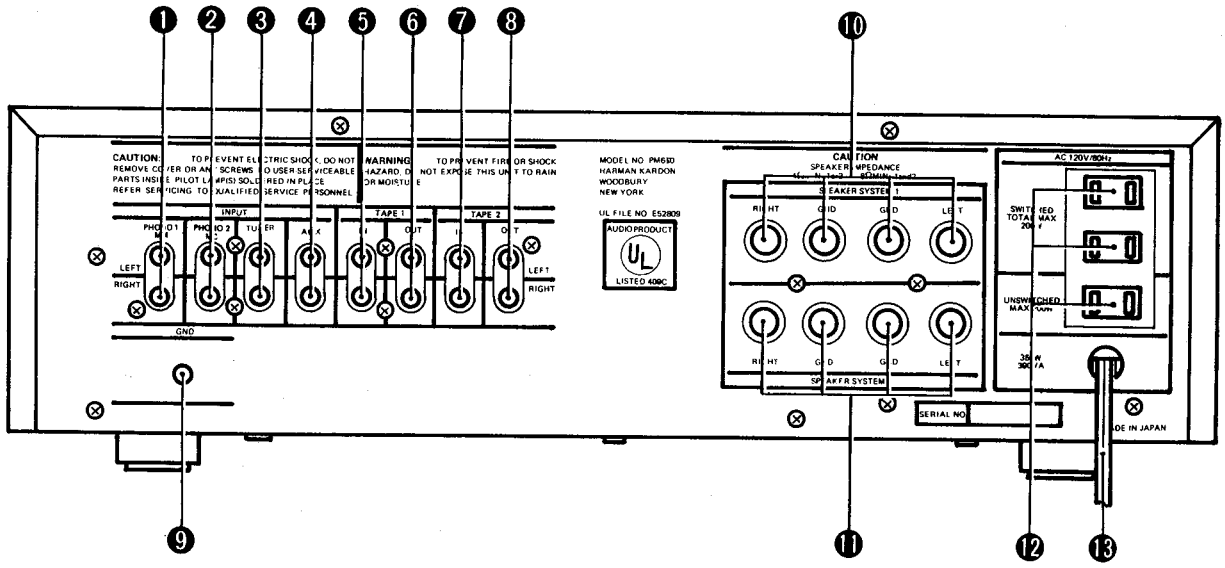
⓰ LOUDNESS SWITCH (loudness)
For emphasis of the low and high frequency ranges to enable impressive reproduction when listening at a low sound volume.

⓱ VOLUME CONTROL KNOB (VOLUME)
For increase/decrease of the sound volume.
Clockwise turn increases the sound volume, and counterclockwise turn decreases it. Set this knob at a minimum level before turning the power on to prevent speaker from being damaged by a sudden booming sound.

⓲ CARTRIDGE SELECTOR (cartridge)
For selection between MM and MC type cartridges.
If your turntable uses an MC tape cartridge, connect it to the PHONO 2 INPUT jacks and depress this switch.
If your turntable uses an MM type cartridge, connect it to the PHONO 1 INPUT jacks and release this switch.

COMPONENTS AND THEIR FUNCTIONS

▪ REAR PANEL



❶PHONO 1 INPUT JACKS (INPUT PHONO 1 MM)
Connect the output cables from your turntable using an MM type cartridge here.

❷PHONO 2 INPUT JACKS (INPUT PHONO 2 MC)
Connect the output cables from your turntable using an MC type cartridge here.

NOTE: When using either PHONO 1 or PHONO 2 INPUT jacks, please insert the attached SHORTING PLUGS into the PHONO INPUT jacks not in use.

❸TUNER INPUT JACKS (INPUT TUNER)
Connect the output cables from your tuner here.

❹AUX INPUT JACKS (INPUT AUX)
Connect the output cables from your TV tuner, etc. here.

❺TAPE 1 INPUT JACKS (TAPE 1 IN)
Connect the output cables from your tape deck or equalizer here.

❻TAPE 1 OUTPUT JACKS (TAPE 1 OUT)
Connect the input cables to your tape deck or equalizer here.

❼TAPE 2 INPUT JACKS (TAPE 2 IN)
Connect the output cables from another tape deck here.

❽TAPE 2 OUTPUT JACKS (TAPE 2 OUT)
Connect the input cables to another tape deck here.

❾GROUND TERMINAL (GND)
Connect the grounding cable from your turntable here.

❿SPEAKER SYSTEM 1 CONNECTORS (SPEAKER SYSTEM 1)
Connect the cables for your speaker system here.
Carefully connect speaker cables so as not to mistake left and right channels and polarities.

⓫SPEAKER SYSTEM 2 CONNECTORS (SPEAKER SYSTEM 2)
Connect the cables for the second speaker system here in the same way as explained for the first SPEAKER SYSTEM.
When using one speaker system, it may be connected to either SPEAKER SYSTEM 1 connectors or SPEAKER SYSTEM 2 connectors.

CAUTION:
2 speaker systems can be connected to this unit.
The minimum speaker impedance shall be 4Ω when only one speaker system is used, or 8Ω when two speaker systems are used.

⓬AC CONVENIENCE OUTLETS
SWITCHED:
Use these outlets to connect your turntable, tuner, cassette deck and/or other components. The power supply to the connected components is interlocked with power on/off of this unit. The total maximum capacity is 200W.

UNSWITCHED:
This outlet is always supplied with the power regardless of the position of the POWER switch of this unit. Interlocked on/off of the connected component is impossible. The maximum capacity is 200W.

⓭AC CORD
Connect this cord to mains outlet. Be sure to turn off the POWER switch before connecting the AC cord.

DISASSEMBLY PROCEDURES

CABINET TOP REMOVAL (Fig. 1)

1. Remove 10 black colored screws ❶ to ⑩ fixing cabinet top.
2. Slide the cabinet top backward gradually to remove.

CABINET BOTTOM ASSEMBLY REMOVAL (Fig. 1)

3. Remove 11 screws ⑪ to ㉑ from the cabinet bottom and remove the cabinet bottom assembly.

FRONT PANEL ASSEMBLY REMOVAL (Fig. 1)

4. Complete steps 1 and 2.
5. Pull off the Volume knob.
6. Remove 6 screws ㉒ to ㉗ fixing front panel.
7. Pull the front panel assembly toward you to remove.

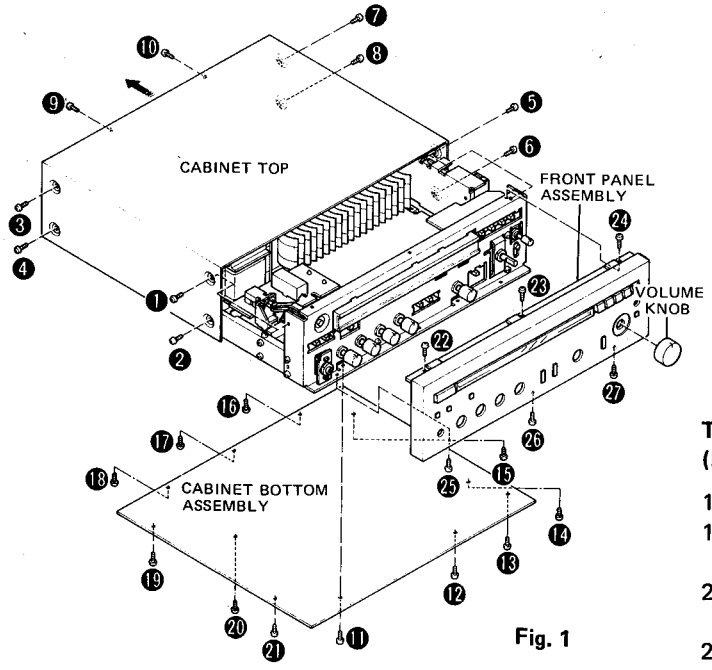


Fig. 1

FRONT CHASSIS WITH P.C. BOARD ASSEMBLIES REMOVAL (Fig. 2)

8. Complete steps 1 through 7.
9. Pull off the Cap. Trim knob.
10. Remove a nut fixing the capacitance trim switch with P.C. board and detach from the front chassis.
11. Remove 7 screws ❶ to ❼ fixing the front chassis.
12. Remove the front chassis while watching out lead wires and the parts around.
    Remove the lead wires, if necessary.

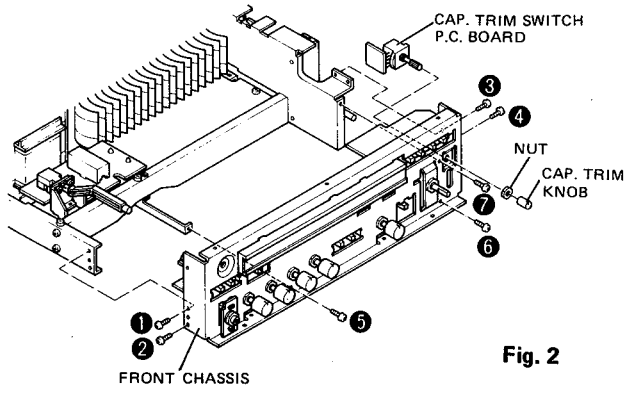


Fig. 2

INDICATION LAMP REFLECTOR REMOVAL (Fig. 3).

13. Complete steps 4 though 7.
14. Since the indication plate in front of the reflector is only fit into the edge of the reflector, strip the edge along the reflector and slide the indication plate right or left to remove.
15. As the reflector is only fit into the front chassis, remove the reflector while pushing the fit-in part. In this case, pay attention not to damage the indication lamp for power and function lamps.

POWER AND FUNCTION INDICATION LAMPS REMOVAL (Fig.3)

16. Complete steps 1 and 2.
17. Insert a screwdriver for slotted screw from the printed side of the P.C. board and turn it counterclockwise.

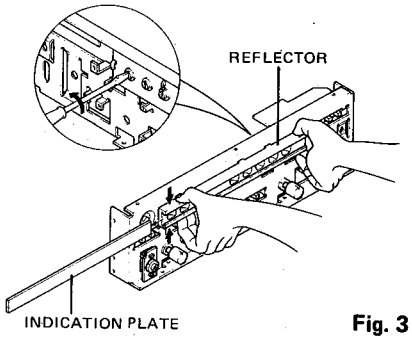


Fig. 3

TONE CONTROL P.C. BOARD ASSEMBLY REMOVAL (Fig. 4)

18. Complete steps 8 through 12.
19. Pull off the Bass, Treble, Balance, Mode selector and Tape Out knobs.
20. Remove 5 nuts fixing bass, treble and balance controllers, and mode selector and tape out switches.
21. Remove 4 screws ❶ to ❹ fixing subsonic, high cut and loudness switches and take out P.C. board.

VOLUME CONTROL P.C. BOARD ASSEMBLY REMOVAL (Fig. 4)

22. Complete steps 8 through 12.
23. Remove a nut fixing volume control with P.C. board and remove it.

INDICATION LAMP P.C. BOARD ASSEMBLY REMOVAL (Fig. 4)

24. Complete steps 8 through 12.
25. Raise up the 5 pawls fixing indication lamp P.C. board to free the P.C. board.

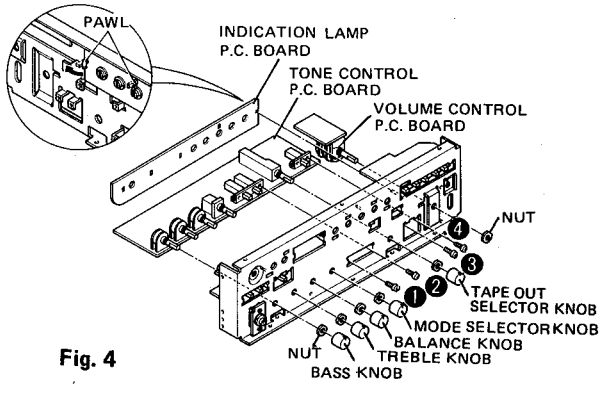


Fig. 4

ALIGNMENT PROCEDURES

IDLING CURRENT ADJUSTMENT

Instrument: DC Voltmeter

Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.
3. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize idling current.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC voltmeter to TP1 (+) and TP2 (–)	VR403	33mV on DC voltmeter
2	DC voltmeter to TP3 (+) and TP4 (–)	VR404	Same as above

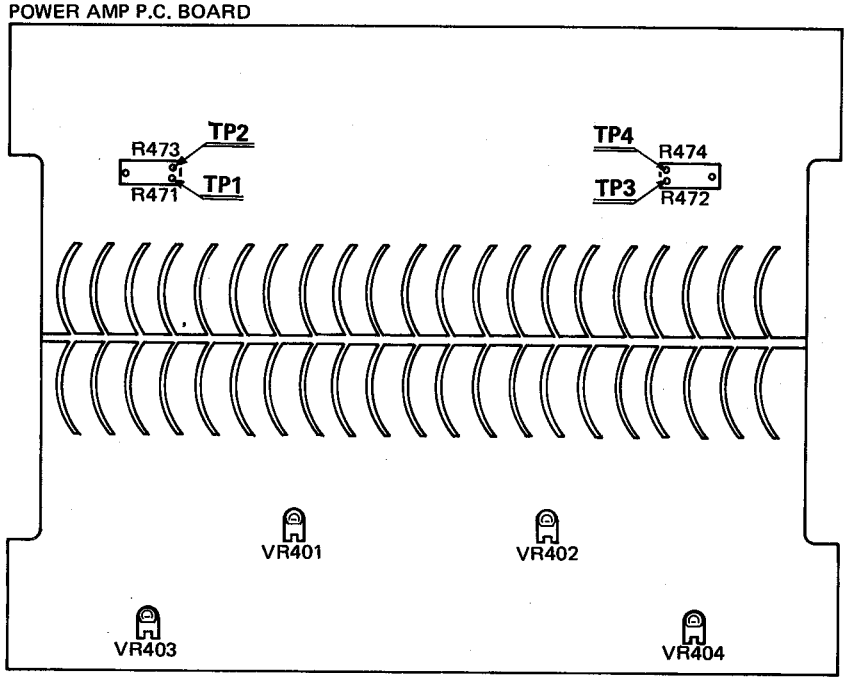
DC VOLTAGE BALANCE ADJUSTMENT

Instrument: DC Voltmeter

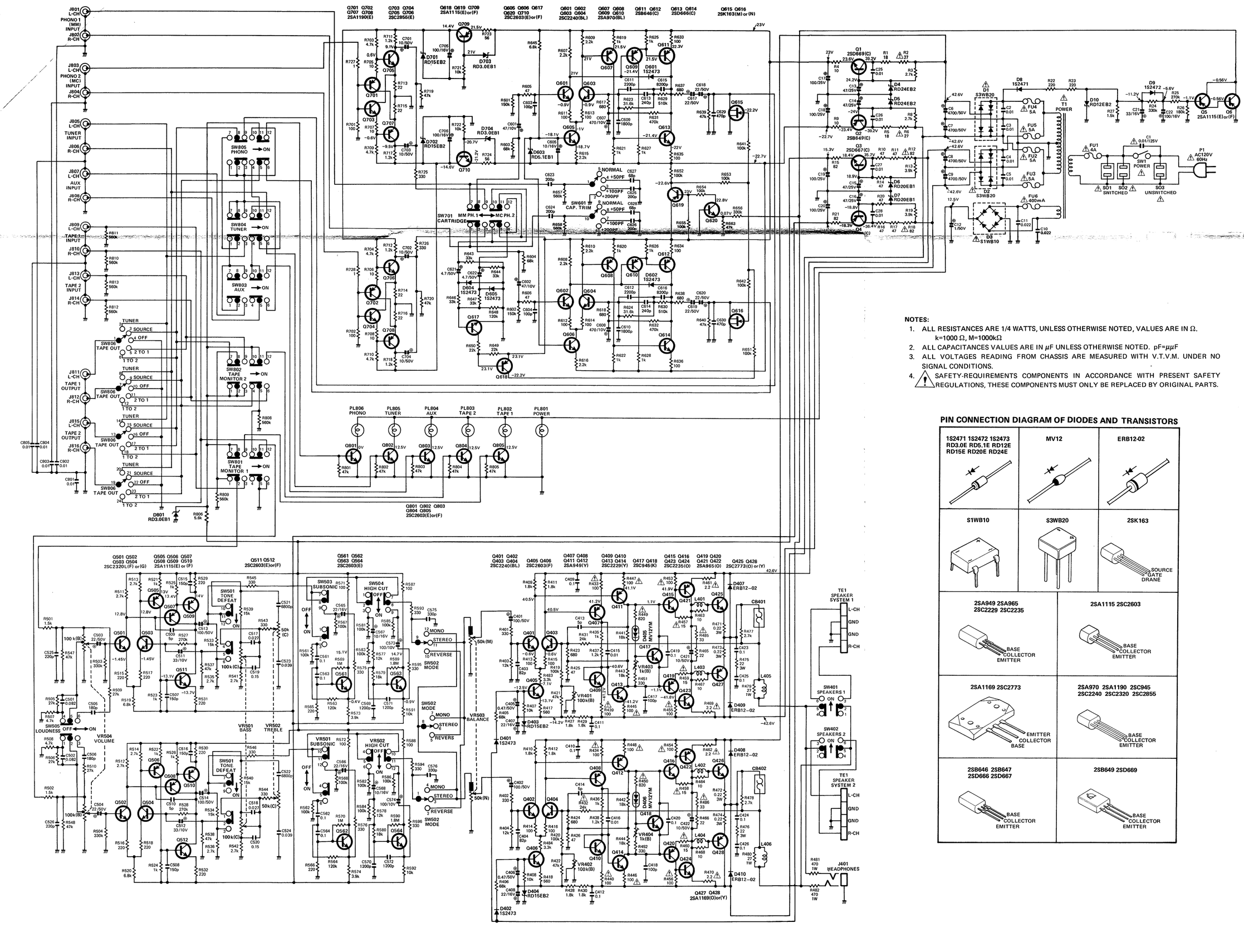
Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.
3. Press in speakers 1 push button to ON position.
4. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize idling current.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC voltmeter to Lch terminal of Speaker System 1	VR401	0V±10mV on DC voltmeter
2	DC voltmeter to Rch terminal of Speaker System 1	VR402	Same as above

ALIGNMENT POINTS LOCATION



SCHEMATIC DIAGRAM

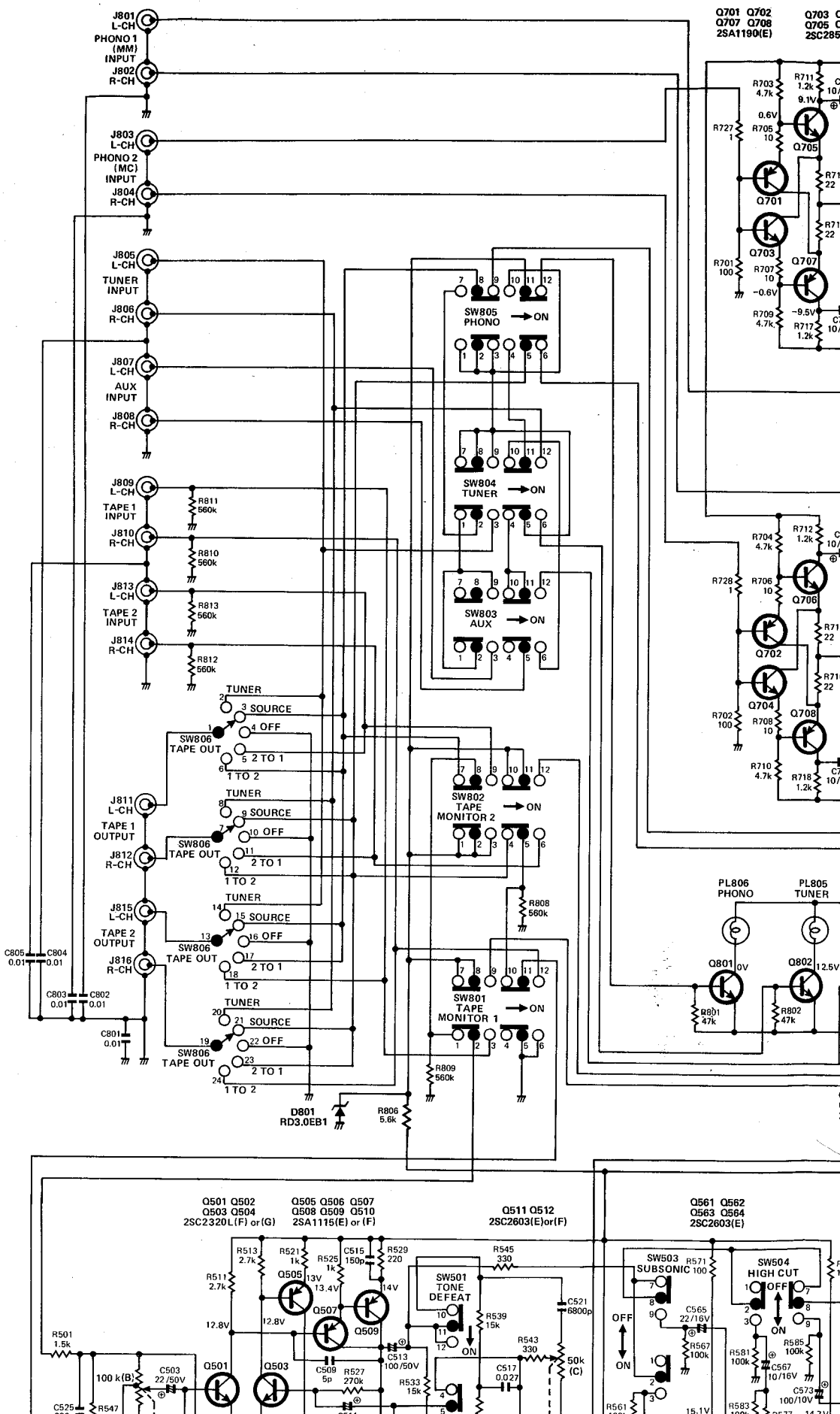


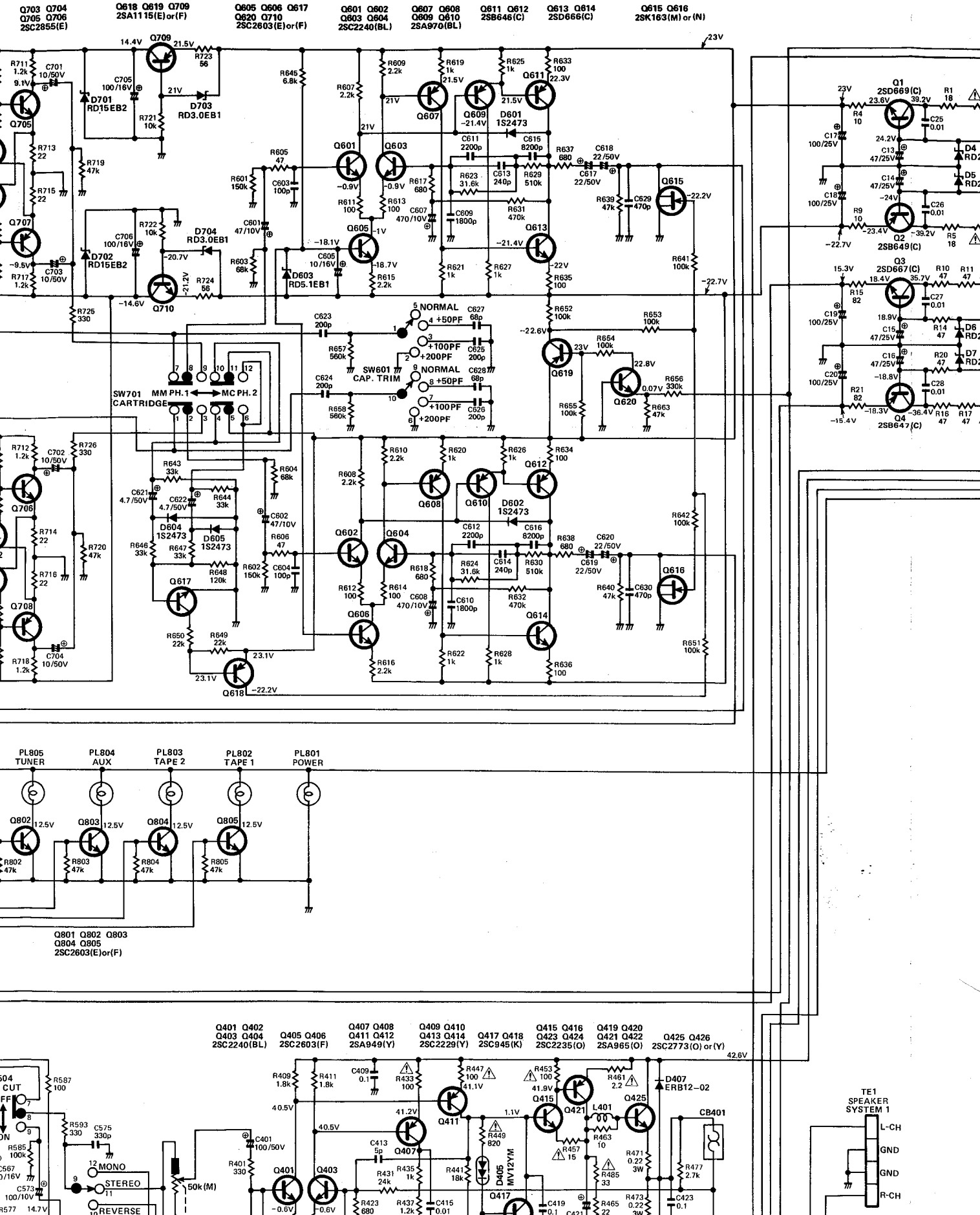
NOTES:

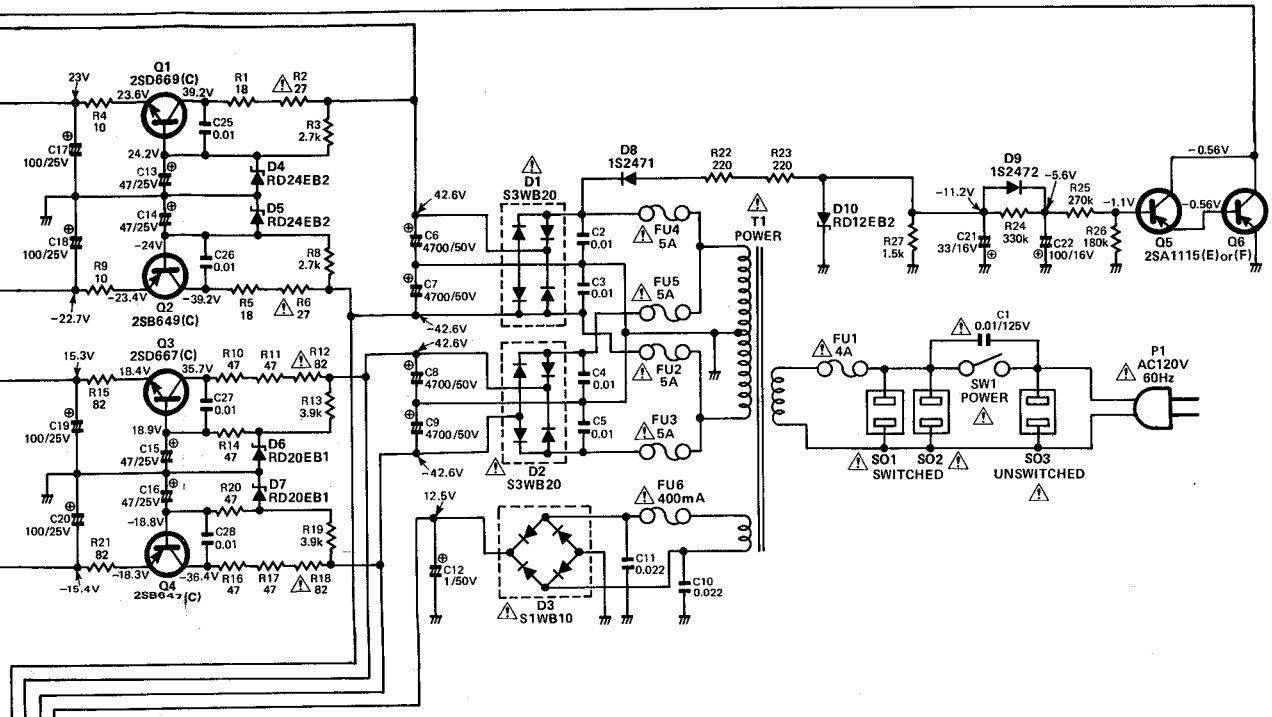
1. ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω. k=1000 Ω, M=1000kΩ
2. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF=μμF
3. ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
4. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

PIN CONNECTION DIAGRAM OF DIODES AND TRANSISTORS

SCHEMATIC DIAGRAM




Q703 Q704 Q705 Q706 2SC2855(E)
Q618 Q619 Q709 2SA1115(E)or(F)
Q805 Q606 Q617 Q620 Q710 2SC2603(E)or(F)
Q601 Q602 Q603 Q604 2SC2240(BL)
Q607 Q608 Q609 Q610 2SA970(BL)
Q611 Q612 2SB646(C)
Q613 Q614 2SD666(C)
Q615 Q616 2SK163(M) or (N)
Q709
Q705
Q707
Q710
Q601
Q603
Q605
Q607
Q609
Q611
Q613
Q615
Q706
Q708
Q617
Q618
Q608
Q610
Q612
Q602
Q604
Q606
Q614
Q616
D701 RD15EB2
D702 RD15EB2
D703 RD3.0EB1
D704 RD3.0EB1
D603 RD5.1EB1
D601 1S2473
D602 1S2473
D604 1S2473
D605 1S2473
SW701 CARTRIDGE
MM PH. 1
MC PH. 2
SW601 CAP. TRIM
NORMAL
+50PF
+100PF
+200PF
Q619
Q620
Q1 2SD669(C)
Q2 2SB649(C)
Q3 2SD667(C)
Q4 2SB647(C)
PL805 TUNER
PL804 AUX
PL803 TAPE 2
PL802 TAPE 1
PL801 POWER
Q802
Q803
Q804
Q805
Q801 Q802 Q803 Q804 Q805 2SC2603(E)or(F)
Q401 Q402 Q403 Q404 2SC2240(BL)
Q405 Q406 2SC2603(F)
Q407 Q408 Q411 Q412 2SA949(Y)
Q409 Q410 Q413 Q414 2SC2229(Y)
Q417 Q418 2SC945(K)
Q415 Q416 Q423 Q424 2SC2235(O)
Q419 Q420 Q421 Q422 2SA965(O)
Q425 Q426 2SC2773(O) or (Y)
Q401
Q403
Q407
Q411
Q417
Q415
Q421
Q425
D405 MV12YM
D407 ERB12-02
L401
CB401
50k(M)
MONO
STEREO
REVERSE
TE1 SPEAKER SYSTEM 1
L-CH
GND
GND
R-CH



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2. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF=μμF
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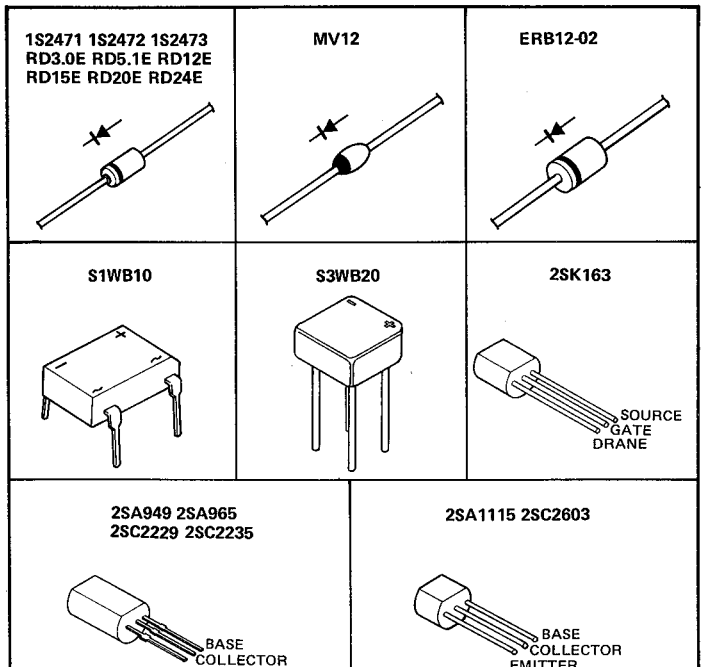
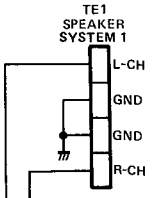
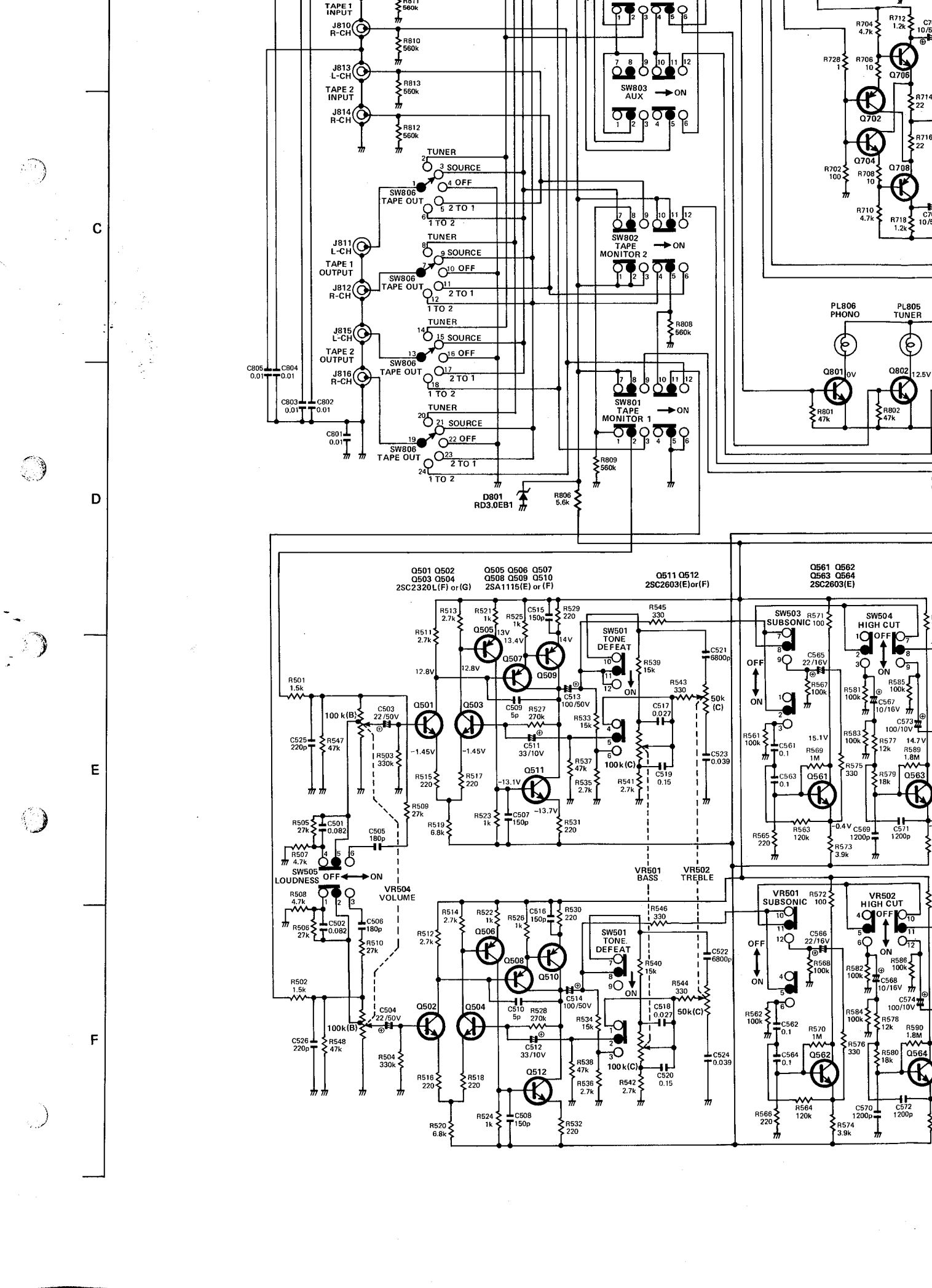
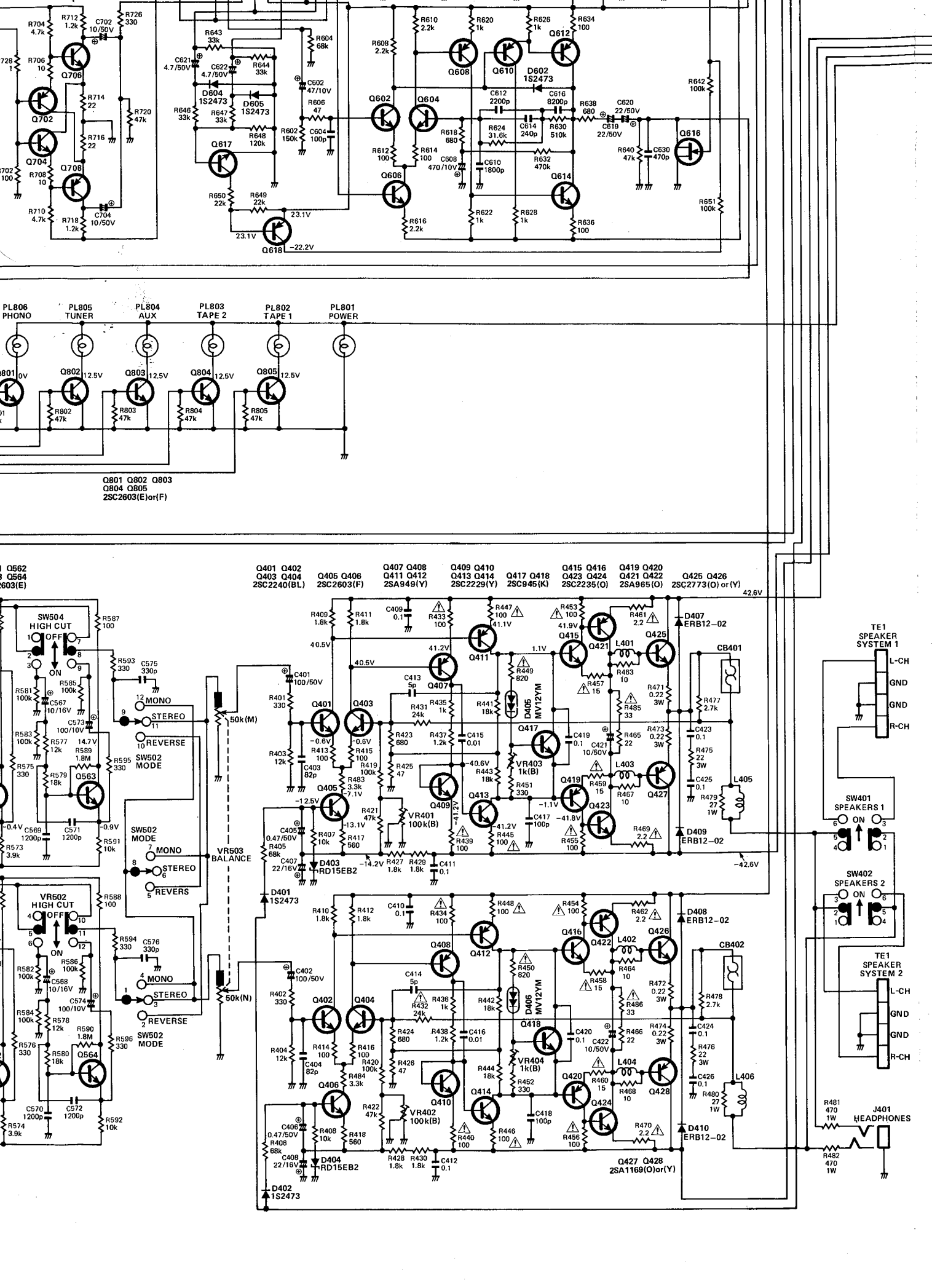
PIN CONNECTION DIAGRAM OF DIODES AND TRANSISTORS





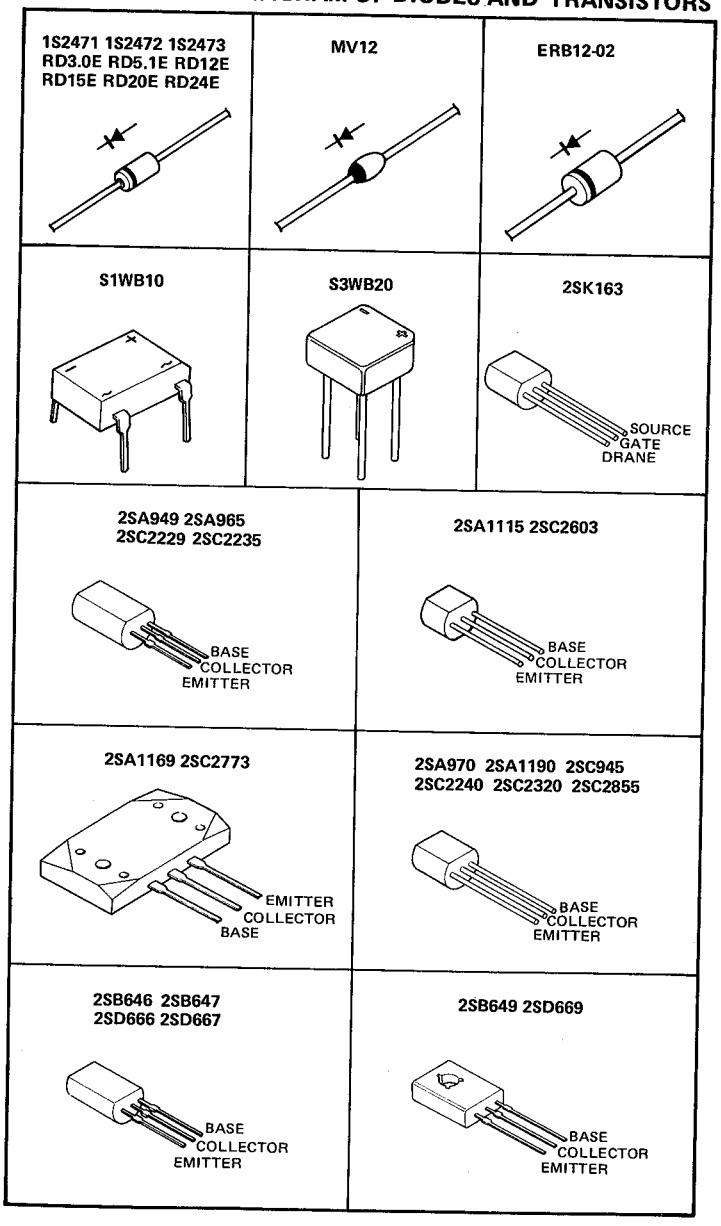

TAPE 1 INPUT
J810 R-CH
J813 L-CH
TAPE 2 INPUT
J814 R-CH
R810 560k
R813 560k
R812 560k
SW803 AUX → ON
TUNER
SOURCE
OFF
SW806 TAPE OUT
2 TO 1
1 TO 2
J811 L-CH
TAPE 1 OUTPUT
J812 R-CH
J815 L-CH
TAPE 2 OUTPUT
J816 R-CH
SW802 TAPE MONITOR 2 → ON
SW801 TAPE MONITOR 1 → ON
R808 560k
R809 560k
C805 0.01
C804 0.01
C803 0.01
C802 0.01
C801 0.01
D801 RD3.0EB1
R806 5.6k
PL806 PHONO
PL805 TUNER
Q801 0V
Q802 12.5V
R801 47k
R802 47k
R704 4.7k
R712 1.2k
R728 1
R706 10
Q706
Q702
Q704
Q708
R714 22
R716 22
R702 100
R708 10
R710 4.7k
R718 1.2k
Q501 Q502 Q503 Q504 2SC2320L(F) or (G)
Q505 Q506 Q507 Q508 Q509 Q510 2SA1115(E) or (F)
Q511 Q512 2SC2603(E)or(F)
Q561 Q562 Q563 Q564 2SC2603(E)
SW501 TONE DEFEAT
SW503 SUBSONIC
SW504 HIGH CUT
R501 1.5k
100 k(B)
C503 22/50V
C525 220p
R547 47k
R503 330k
R509 27k
R505 27k
C501 0.082
C505 180p
R507 4.7k
SW505 LOUDNESS OFF ↔ ON
VR504 VOLUME
R508 4.7k
R506 27k
C502 0.082
C506 180p
R510 27k
R502 1.5k
C504 22/50V
100k(B)
C526 220p
R548 47k
R504 330k
R513 2.7k
R511 2.7k
R521 1k
R525 1k
C515 150p
R529 220
R545 330
C521 6800p
R539 15k
R543 330
50k (C)
C513 100/50V
C509 5p
R527 270k
C511 33/10V
R533 15k
C517 0.027
100k(C)
C519 0.15
C523 0.039
R537 47k
R535 2.7k
R541 2.7k
R515 220
R517 220
R519 6.8k
R523 1k
C507 150p
R531 220
-1.45V
-13.1V
-13.7V
12.8V
R514 2.7k
R512 2.7k
R522 1k
R526 1k
C516 150p
R530 220
R546 330
C522 6800p
R540 15k
R544 330
50k(C)
C514 100/50V
C510 5p
R528 270k
C512 33/10V
R534 15k
C518 0.027
100k(C)
C520 0.15
C524 0.039
R538 47k
R536 2.7k
R542 2.7k
R516 220
R518 220
R520 6.8k
R524 1k
C508 150p
R532 220
VR501 BASS
VR502 TREBLE
R571 100
C565 22/16V
R567 100k
R581 100k
C567 10/16V
R585 100k
C573 100/10V
R561 100k
C561 0.1
R569 1M
15.1V
R583 100k
R577 12k
14.7V
R589 1.8M
R575 330
C563 0.1
Q561
R579 18k
Q563
R563 120k
-0.4V
C569 1200p
C571 1200p
R565 220
R573 3.9k
R572 100
C566 22/16V
R568 100k
R582 100k
C568 10/16V
R586 100k
C574 100/10V
R562 100k
C562 0.1
R570 1M
R584 100k
R578 12k
R590 1.8M
R576 330
C564 0.1
Q562
R580 18k
Q564
R564 120k
C570 1200p
C572 1200p
R566 220
R574 3.9k
OFF
ON

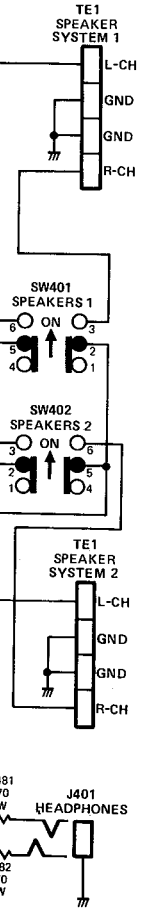

PL806 PHONO
PL805 TUNER
PL804 AUX
PL803 TAPE 2
PL802 TAPE 1
PL801 POWER
Q801 Q802 Q803
Q804 Q805
2SC2603(E)or(F)
Q401 Q402
Q403 Q404
2SC2240(BL)
Q405 Q406
2SC2603(F)
Q407 Q408
Q411 Q412
2SA949(Y)
Q409 Q410
Q413 Q414
2SC2229(Y)
Q417 Q418
2SC945(K)
Q415 Q416
Q423 Q424
2SC2235(O)
Q419 Q420
Q421 Q422
2SA965(O)
Q425 Q426
2SC2773(O) or (Y)
Q427 Q428
2SA1169(O)or(Y)
SW504 HIGH CUT
SW502 MODE
VR503 BALANCE
VR502 HIGH CUT
SW401 SPEAKERS 1
SW402 SPEAKERS 2
TE1 SPEAKER SYSTEM 1
TE1 SPEAKER SYSTEM 2
J401 HEADPHONES
D401 1S2473
D402 1S2473
D403 RD15EB2
D404 RD15EB2
D405 MV12YM
D406 MV12YM
D407 ERB12-02
D408 ERB12-02
D409 ERB12-02
D410 ERB12-02
VR401 100k(B)
VR402 100k(B)
VR403 1k(B)
VR404 1k(B)
CB401
CB402
L401
L402
L403
L404
L405
L406
42.6V
-42.6V

NOTES:

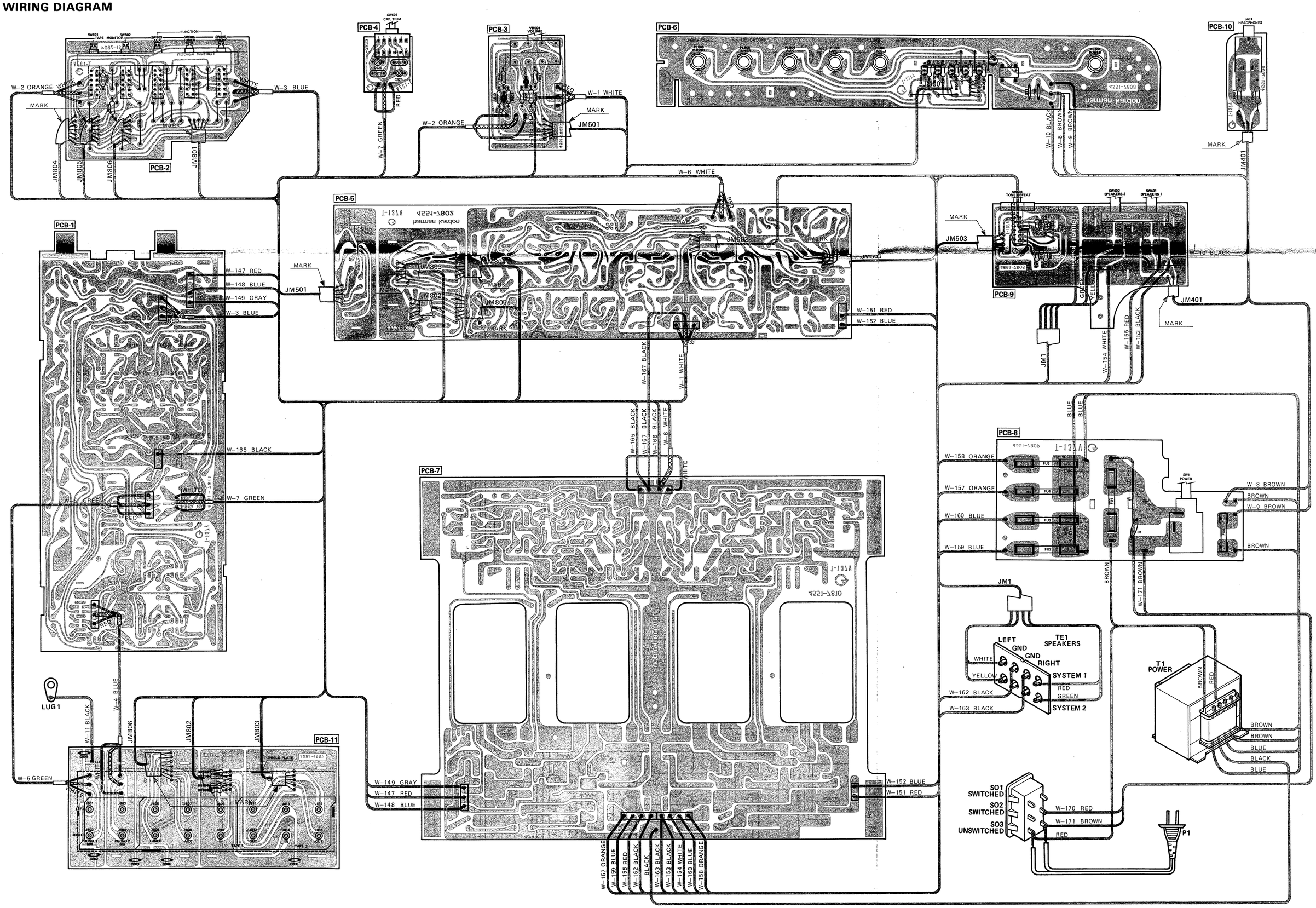
1. ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω.
   k=1000 Ω, M=1000kΩ
2. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF=μμF
3. ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
4. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

PIN CONNECTION DIAGRAM OF DIODES AND TRANSISTORS

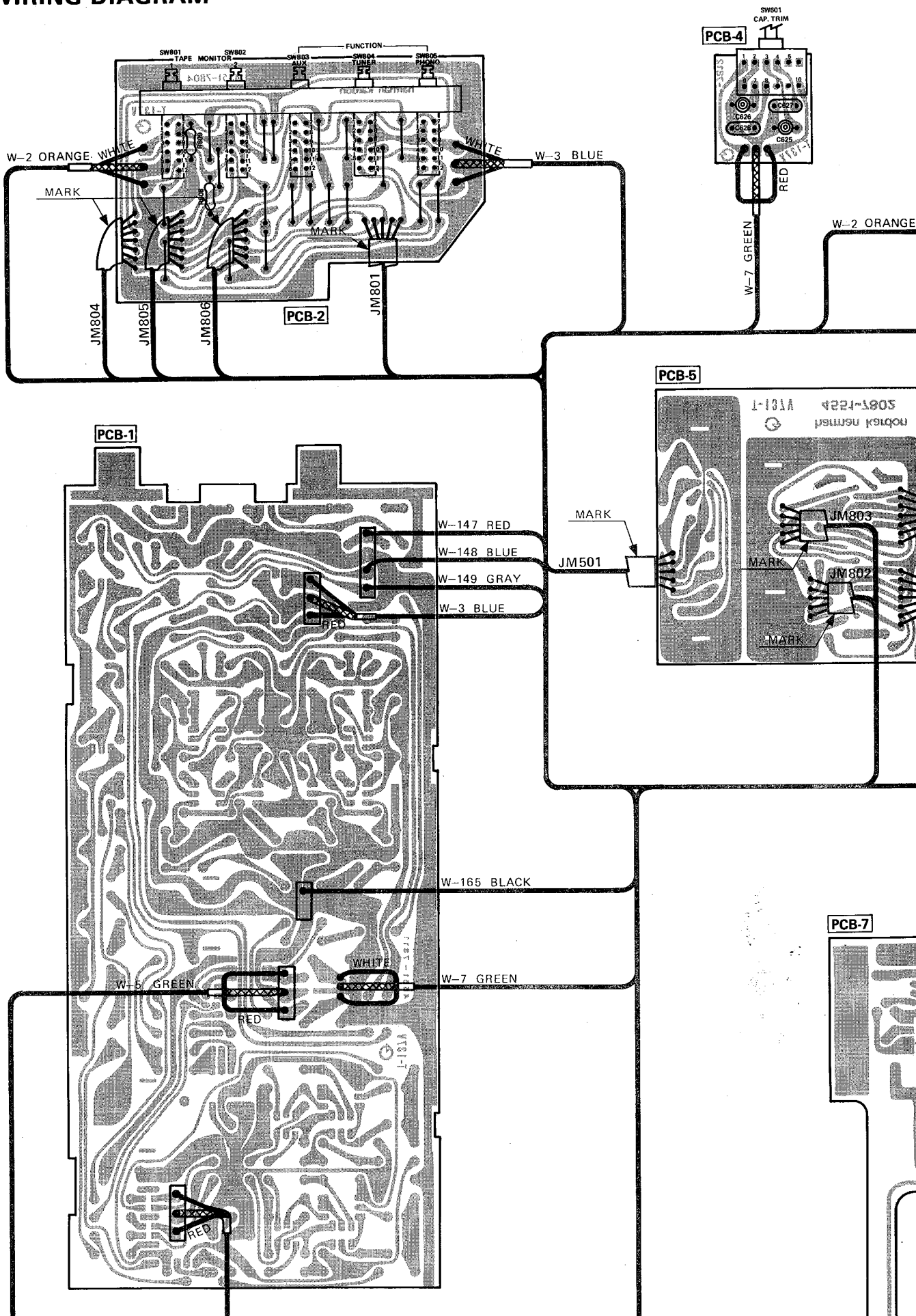


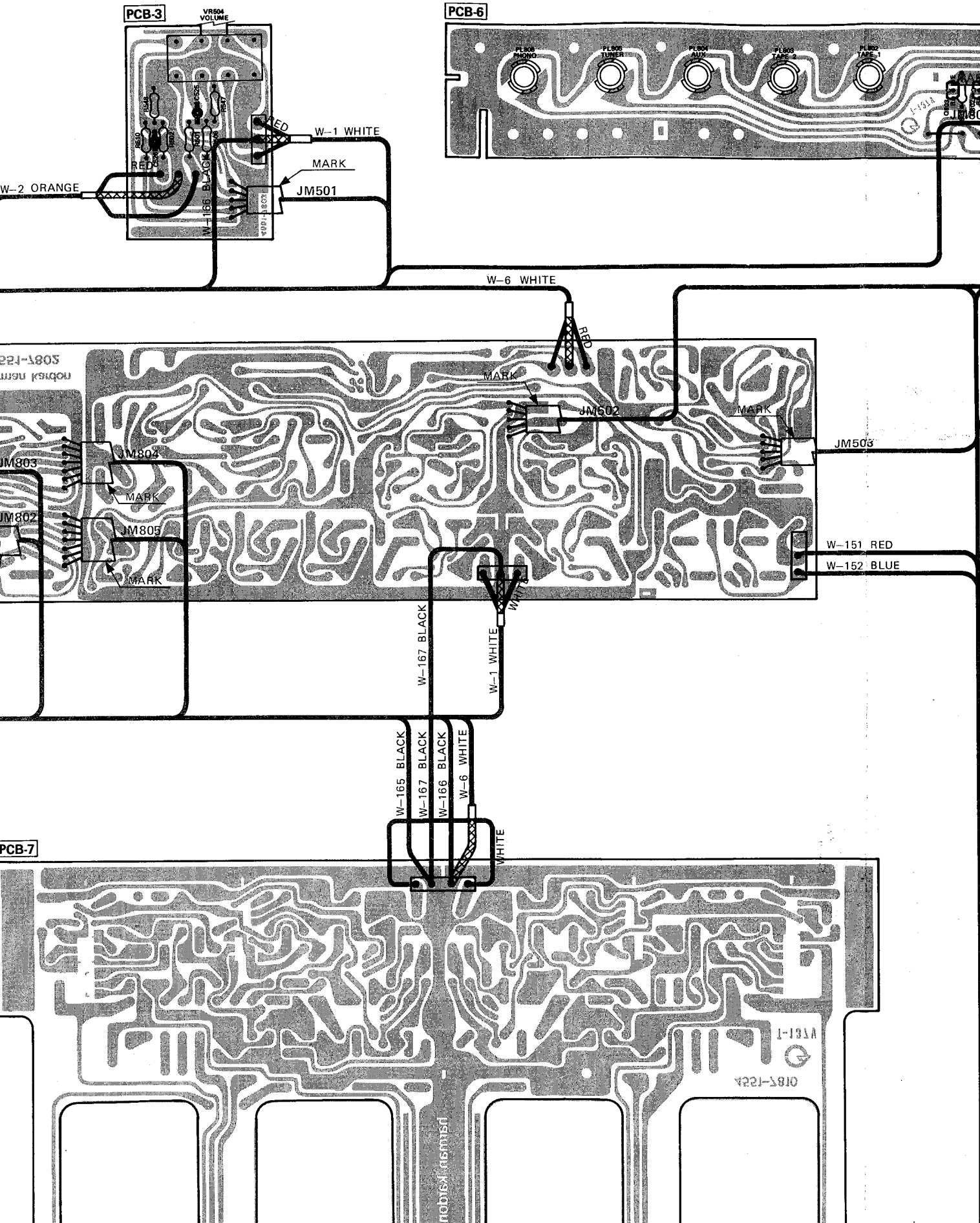


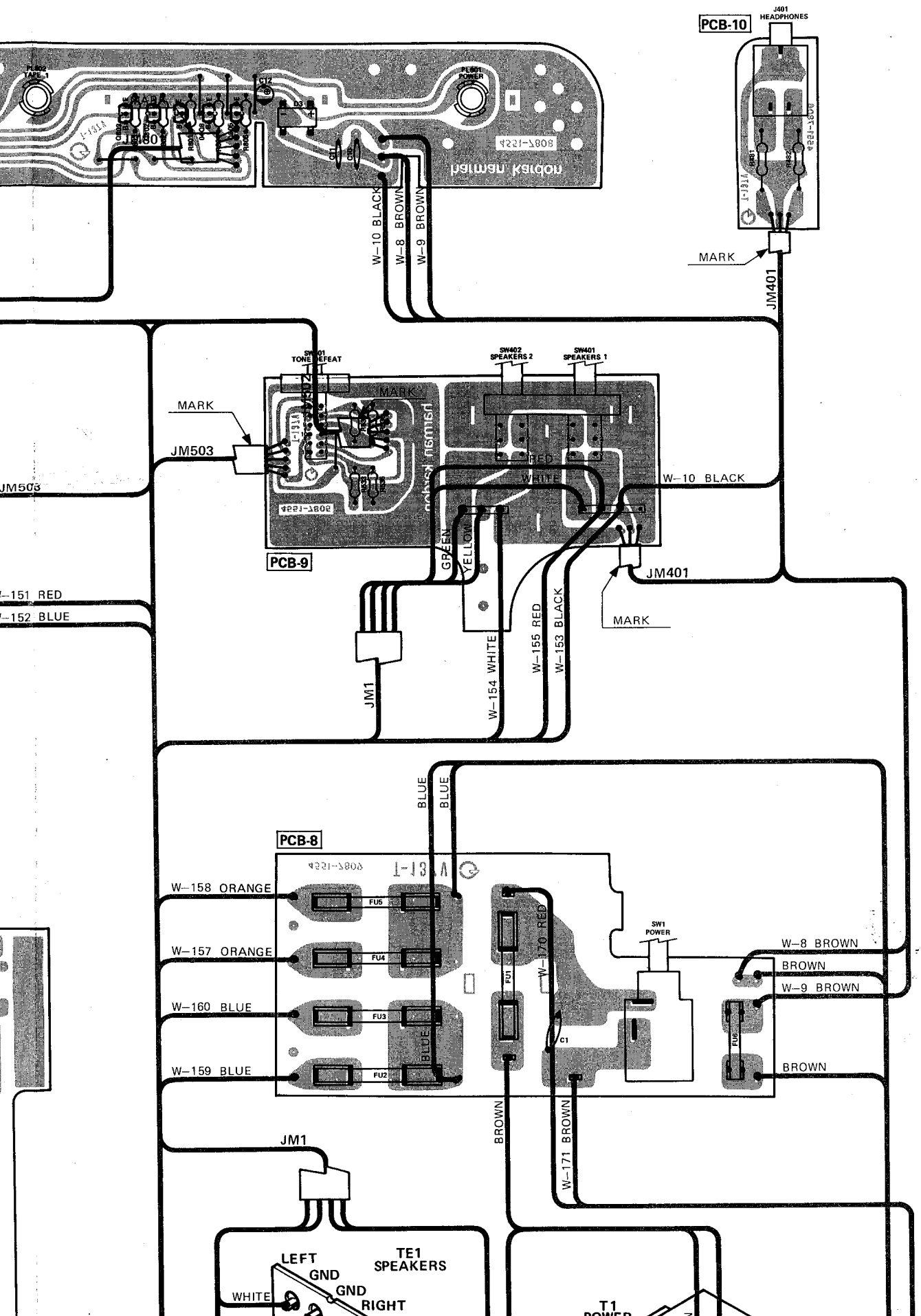
WIRING DIAGRAM

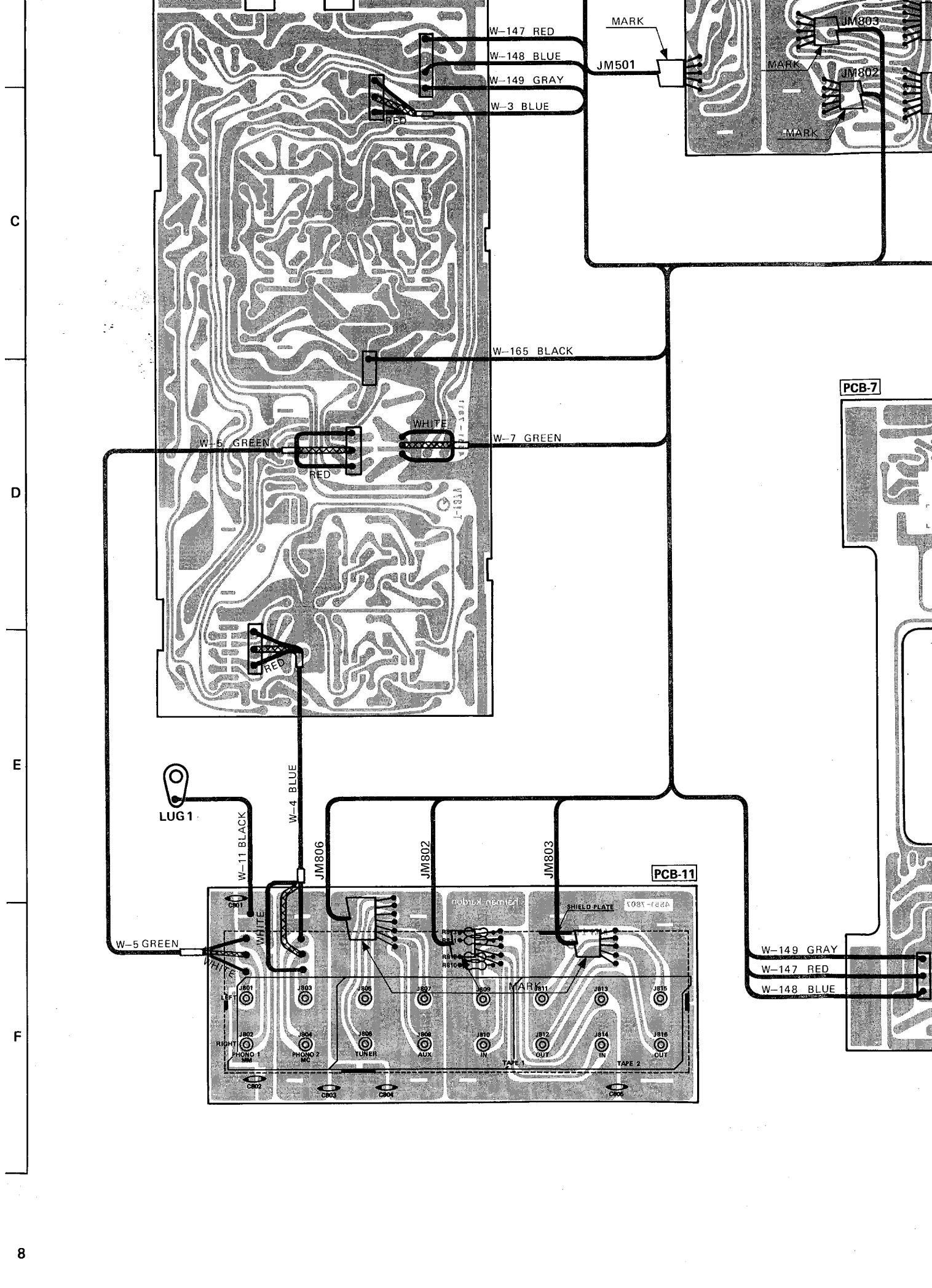


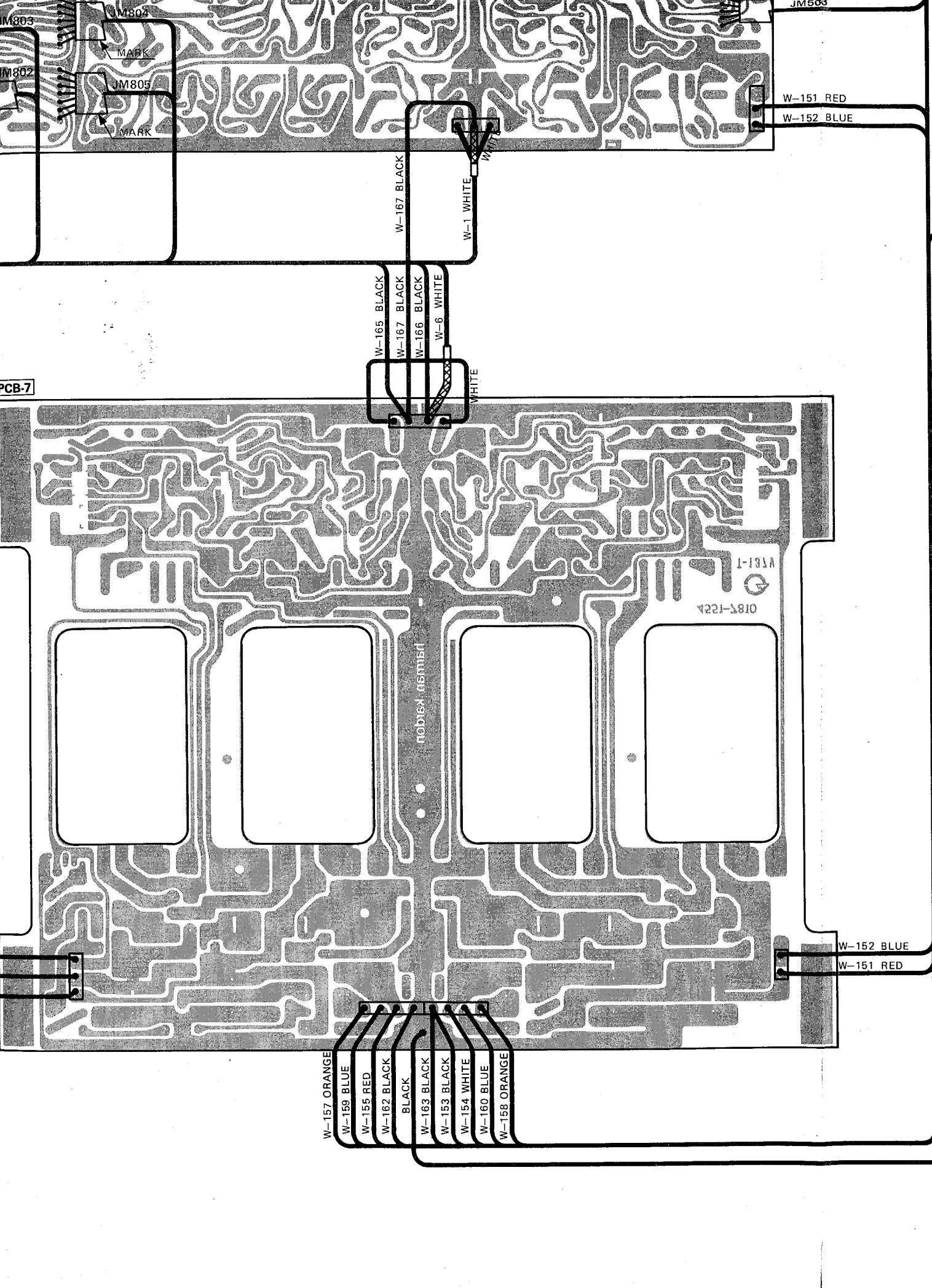
WIRING DIAGRAM

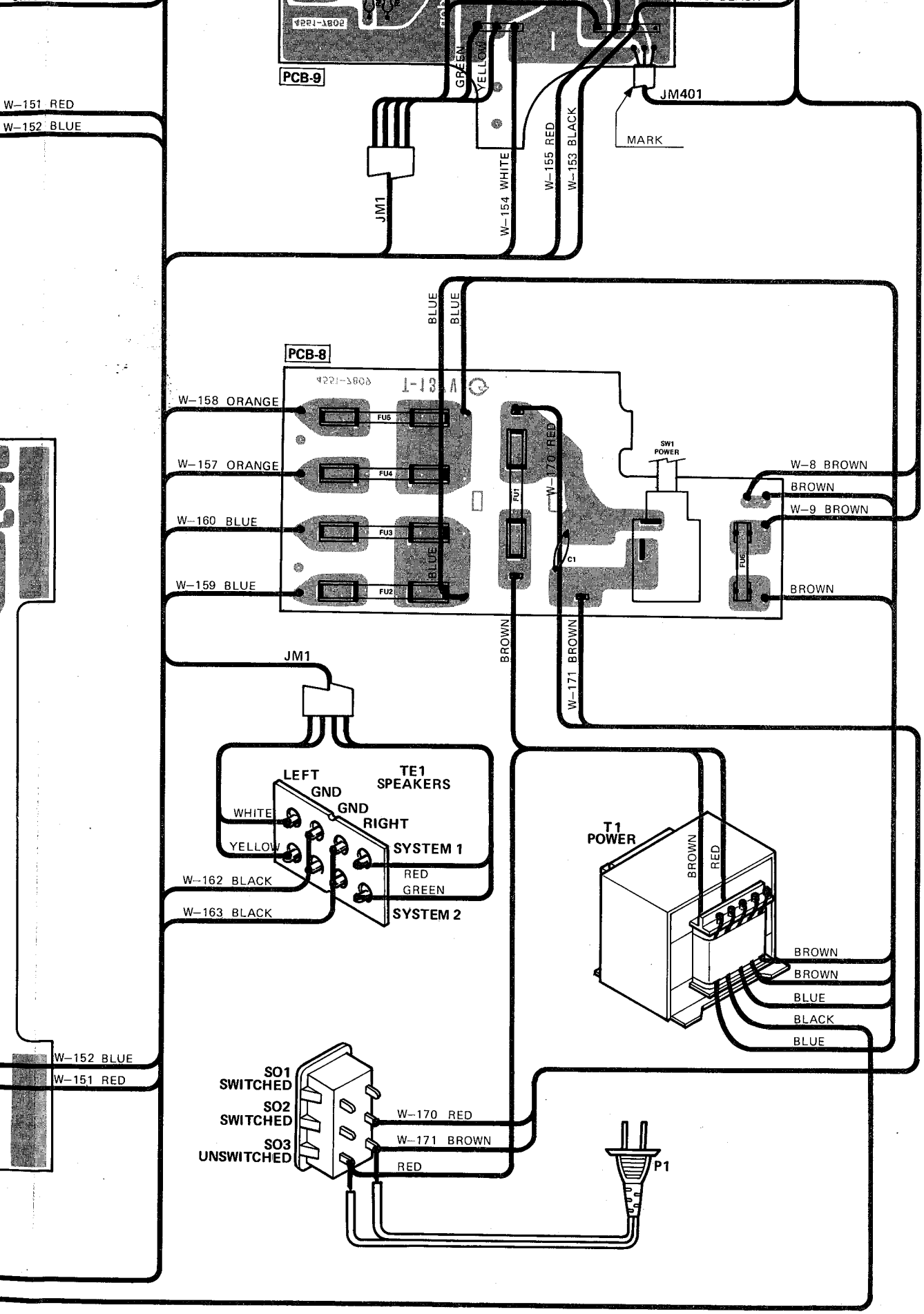



PCB-3
VR504 VOLUME
RED
W-1 WHITE
MARK
JM501
W-2 ORANGE
W-166 BLACK
RED
PCB-6
PL505 PHONO
PL506 TUNER
PL504 AUX
PL503 TAPE-2
PL502 TAPE-1
W-6 WHITE
RED
MARK
JM502
MARK
JM503
JM804
MARK
JM805
MARK
W-151 RED
W-152 BLUE
WHITE
W-167 BLACK
W-1 WHITE
W-165 BLACK
W-167 BLACK
W-166 BLACK
W-6 WHITE
WHITE
PCB-7

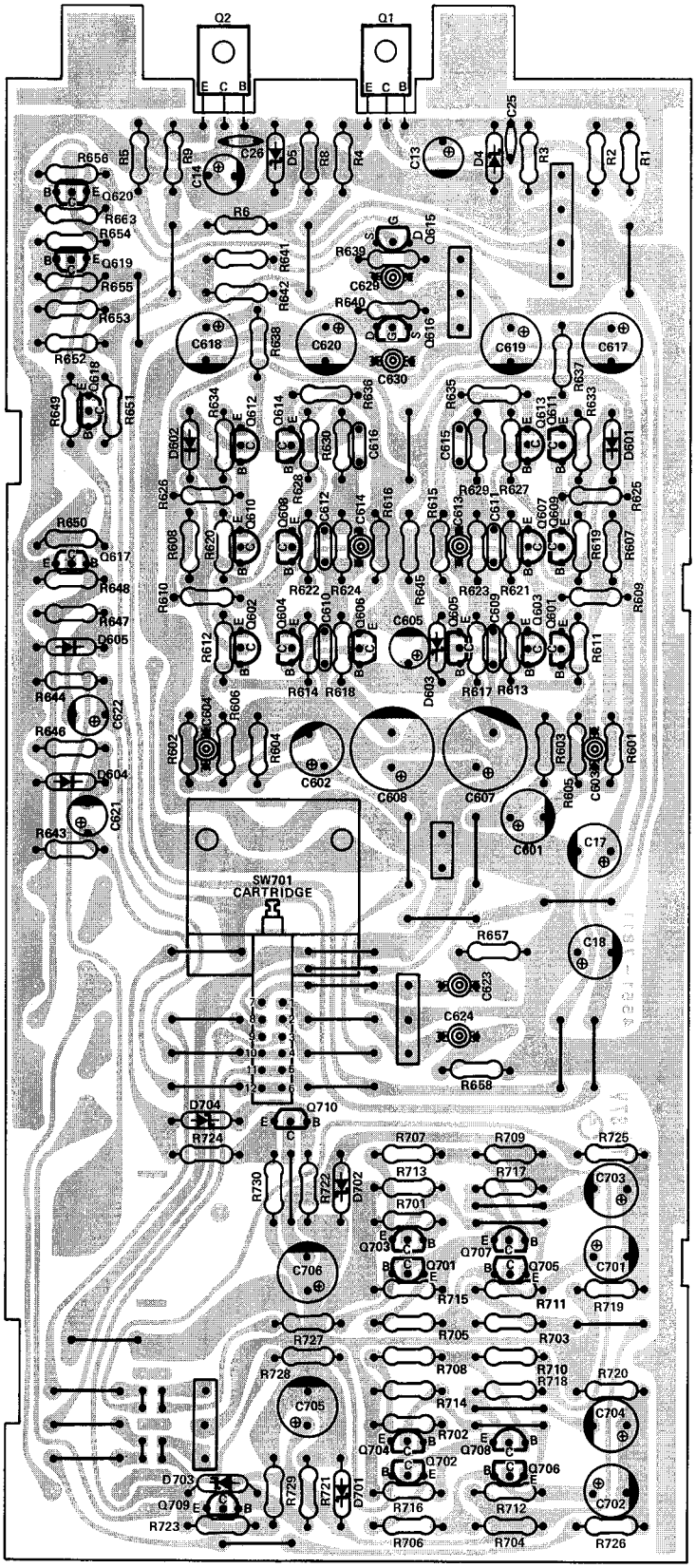

PCB-10
J401 HEADPHONES
W-10 BLACK
W-8 BROWN
W-9 BROWN
MARK
JM401
SW402 SPEAKERS 2
SW401 SPEAKERS 1
MARK
JM503
RED
WHITE
W-10 BLACK
PCB-9
GREEN
YELLOW
JM401
MARK
W-151 RED
W-152 BLUE
JM1
W-154 WHITE
W-155 RED
W-153 BLACK
BLUE
BLUE
PCB-8
W-158 ORANGE
W-157 ORANGE
W-160 BLUE
W-159 BLUE
FU5
FU4
FU3
FU2
FU1
FU6
W-170 RED
C1
SW1 POWER
W-8 BROWN
BROWN
W-9 BROWN
BROWN
BROWN
W-171 BROWN
JM1
LEFT
GND
GND
RIGHT
WHITE
TE1 SPEAKERS


W-147 RED
W-148 BLUE
W-149 GRAY
W-3 BLUE
MARK
JM501
JM803
JM802
MARK
MARK
RED
W-165 BLACK
PCB-7
WHITE
W-5 GREEN
W-7 GREEN
RED
RED
LUG 1
W-11 BLACK
W-4 BLUE
JM806
JM802
JM803
PCB-11
SHIELD PLATE
W-5 GREEN
WHITE
WHITE
W-149 GRAY
W-147 RED
W-148 BLUE
MARK
LEFT
RIGHT
PHONO 1 MM
PHONO 2 MC
TUNER
AUX
IN
OUT
TAPE 1
IN
OUT
TAPE 2
C801
C802
C803
C804
C805

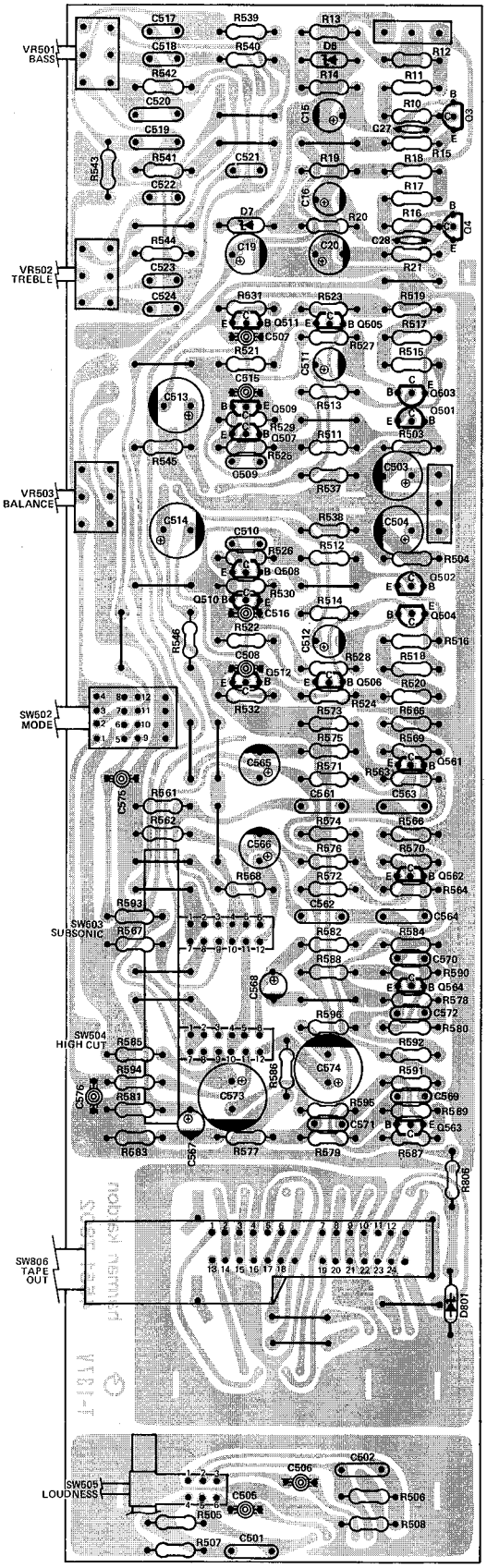

JM804
MARK
JM805
MARK
W-167 BLACK
W-1 WHITE
W-165 BLACK
W-167 BLACK
W-166 BLACK
W-6 WHITE
WHITE
W-151 RED
W-152 BLUE
PCB-7
W-152 BLUE
W-151 RED
W-157 ORANGE
W-159 BLUE
W-155 RED
W-162 BLACK
BLACK
W-163 BLACK
W-153 BLACK
W-154 WHITE
W-160 BLUE
W-158 ORANGE


PCB-9
GREEN
YELLOW
JM401
MARK
W-151 RED
W-152 BLUE
JM1
W-154 WHITE
W-155 RED
W-153 BLACK
BLUE
BLUE
PCB-8
W-158 ORANGE
W-157 ORANGE
W-160 BLUE
W-159 BLUE
FU5
FU4
FU3
FU2
FU1
W-170 RED
SW1
POWER
W-8 BROWN
BROWN
W-9 BROWN
BROWN
C1
BLUE
BROWN
W-171 BROWN
JM1
LEFT
GND
GND
RIGHT
TE1
SPEAKERS
WHITE
YELLOW
SYSTEM 1
RED
GREEN
SYSTEM 2
W-162 BLACK
W-163 BLACK
T1
POWER
BROWN
RED
BROWN
BROWN
BLUE
BLACK
BLUE
W-152 BLUE
W-151 RED
SO1
SWITCHED
SO2
SWITCHED
SO3
UNSWITCHED
W-170 RED
W-171 BROWN
RED
P1

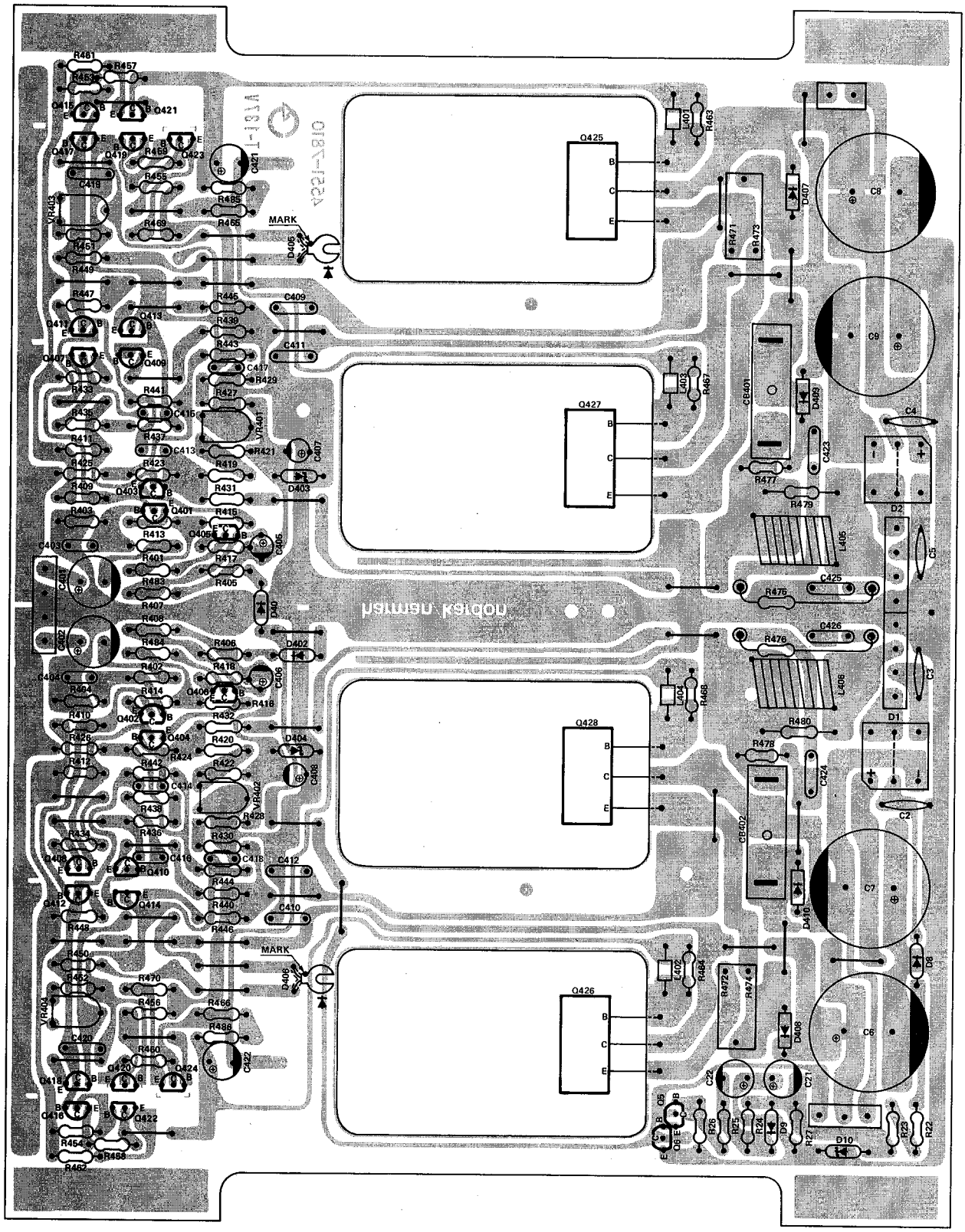
PCB-1 PHONO EQUALIZER P.C. BOARD



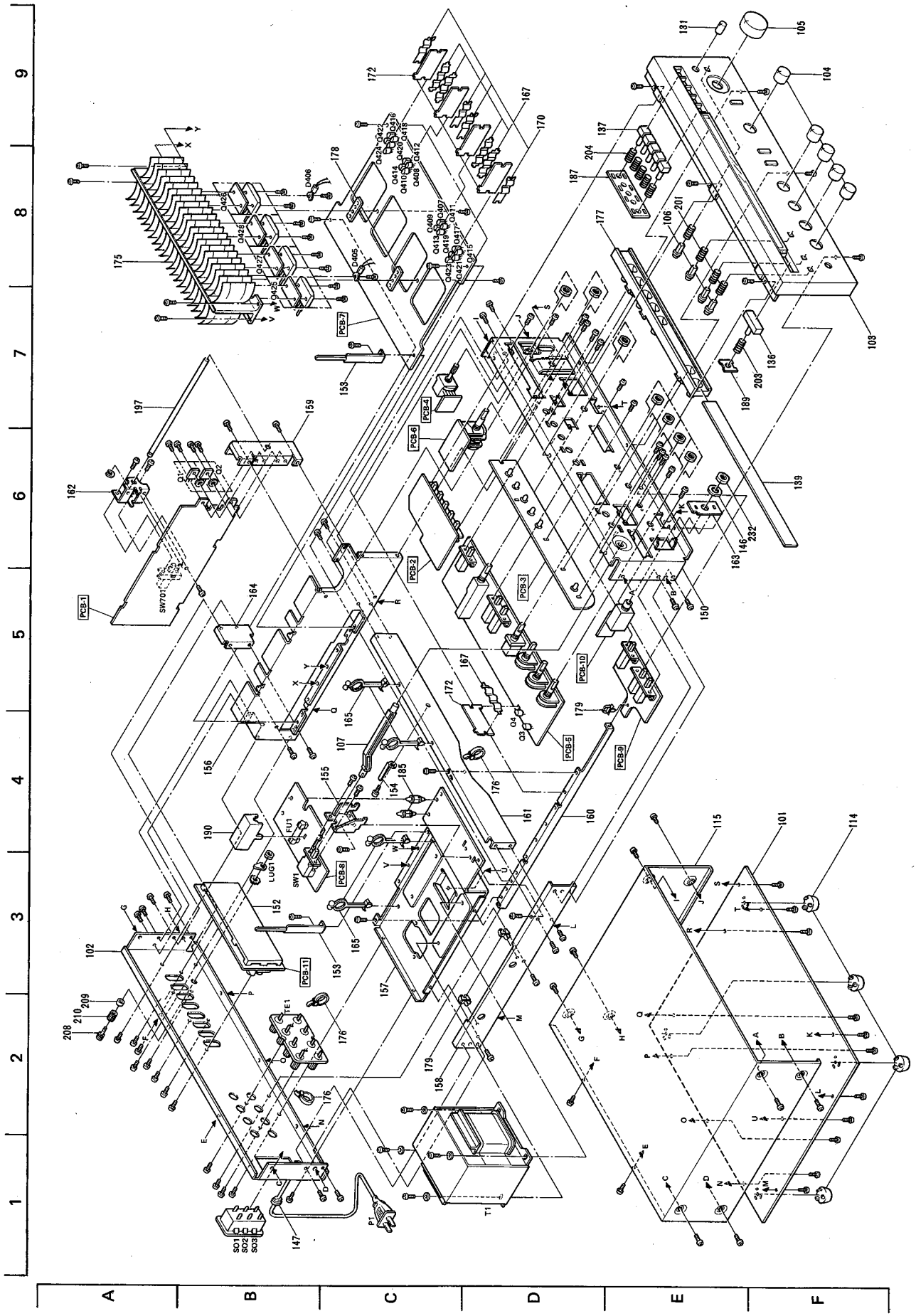
PCB-5 TONE CONTROL P.C. BOARD



PCB-7 POWER AMP. P.C. BOARD



GENERAL UNIT EXPLODED VIEW



GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A423-PM650	Cabinet Bottom Assembly
102	A424-PM650	Cabinet Back Assembly
103	A443-PM650	Front Panel Assembly (Includes: Subsonic, High Cut and Loudness Push Buttons)
104	A630-PM650-A	Knob Assembly, Bass, Treble, Balance, Mode, Tape Out
105	A630-PM650-B	Knob Assembly, Volume
106	A662-PM650	Push Button Assembly, Speakers 1, Speakers 2, Tone Defeat, Cartridge
107	B601-PM650	Shaft Assembly, Power Switch
114	1319-0139	Foot
115	1414-02401	Cabinet Top
131	1634-02701	Knob, Cap. Trim
136	1662-008001BW	Push Button, Power
137	1662-08101BW	Push Button, Tape Monitor 1/2, AUX, Tuner, Phono
139	1721-01901	Indication Plate
146	2114-72167	Bushing
147	2114-415027	Bushing
150	2211-7219	Chassis
152	2216-7117	Shield Plate
153	2218-7011	Holding Bracket
154	2218-7001	Holding Bracket
155	2219-7787	Bracket
156	2219-7788	Bracket
157	2219-7789	Bracket
158	2219-7790	Bracket
159	2219-7791	Bracket
160	2219-7792	Bracket
161	2219-7793	Bracket
162	2219-7794	Bracket
163	2219-7726	Bracket
164	2219-7816	Bracket
165	2240-7050	Holder
167	2222-7100	Heat Sink
170	2222-7101	Heat Sink
172	2222-7103	Heat Sink
175	2222-7120	Heat Sink
176	2240-7120	Holder
177	2223-7044	Reflector
178	2224-7069	Insulator
179	2224-7061	Holder
185	2240-7151	Holder
187	2240-7167	Holder
189	2240-7173	Holder
190	2240-7176	Holder
197	2601-7097	Shaft
201	2651-210187	Spring
203	2651-210196	Spring
204	2651-210195	Spring
208	2310-7015	Special Screw
209	2410-7005	Special Washer
210	2410-7011	Special Nut
232	2440-61	Special Nut

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
CHASSIS MISCELLANEOUS		
P1	4161-71147	AC Line Cord
SO1,2,3	4474-156	AC Outlets, Switched, Unswitched
T1	5584-701366	Power Transformer
TE1	4214-121	Speaker Terminals, Speaker System 1/2
JM1	4242-047025	Jumper Lead, 4-Wire
JM401	4242-030022	Jumper Lead, 3-Wire
JM501	4242-050032	Jumper Lead, 5-Wire
JM502,503	4242-050042	Jumper Lead, 5-Wire
JM801	4242-050052	Jumper Lead, 5-Wire
JM802,803	4242-050062	Jumper Lead, 5-Wire
JM804,805	4242-070052	Jumper Lead, 7-Wire
JM806	4242-070062	Jumper Lead, 7-Wire
LUG1	4211-4	Lug Terminal
PCB-1 PHONO EQUALIZER P.C. BOARD		
	RESISTORS	
R2,6	5102-2704713	27 Ω, ±2%, 1/4W, Fuse
R617,618	5174-681381	680 Ω, ±1%, 1/4W, Metal
R623,624	5174-Z316228	31.6 kΩ, ±0.5%, 1/4W, Metal
R629,630	5174-514381	510 kΩ, ±1%, 1/4W, Metal
	CAPACITORS	
C13,14	5345-476-25	47μF, +50% −10%, 25V, Electrolytic
C17,18	5345-107D041	100μF, ±20%, 25V, Electrolytic
C601,602	5345-476B0226	47μF, ±20%, 10V, Electrolytic
C605	5345-106-16	10μF, +50% −10%, 16V, Electrolytic
C607,608	5345-477B0228	470μF, ±20%, 10V, Electrolytic
C609,610	5359-182771	1800pF, ±2%, 50V, Polypropylene
C611,612	5359-222771	2200pF, ±2%, 50V, Polypropylene
C615,616	5359-822771	8200pF, ±2%, 50V, Polypropylene
C617,618,619,620	5345-226F0228	22μF, ±20%, 50V, Electrolytic
C621,622	5345-475D0211	4.7μF, ±20%, 25V, Electrolytic
C701,702,703,704	5345-106F0228	10μF, ±20%, 50V, Electrolytic
C705,706	5345-107C0226	100μF, ±20%, 16V, Electrolytic
	TRANSISTORS	
Q1	5614-669(C)	2SD669(C), Voltage Regulator
Q2	5612-649(C)	2SB649(C), Voltage Regulator
Q601,602,603,604	5613-2240(BL)	2SC2240(BL), } Equalizer Amp.
Q605,606	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), } Equalizer Amp.
Q607,608,609,610	5611-970(BL)	2SA970(BL), } Equalizer Amp.
Q611,612	5612-646(C)	2SB646(C), } Equalizer Amp.
Q613,614	5614-666(C)	2SD666(C), } Equalizer Amp.
Q615,616	5616-2SK163(M)or(N)	F.E.T., 2SK163(M) or 2SK163(N), Phono Muting
Q617	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), } Cartridge Switch Muting
Q618	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), } Cartridge Switch Muting
Q619	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), } Power ON/OFF Muting
Q620	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), } Power ON/OFF Muting
Q701,702,707,708	5611-1190(E)	2SA1190(E), } MC Amp.
Q703,704,705,706	5613-2855(E)	2SC2855(E), } MC Amp.
Q709	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), Voltage Regulator
Q710	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), Voltage Regulator
	DIODES	
D4,5	5635-RD24EB2	Zener, RD24EB2
D601,602,604,605	5631-1S2473	1S2473
D603	5635-RD5R1EB1	Zener, RD5.1EB1
D701,702	5635-RD15EB2	Zener, RD15EB2
D703,704	5635-RD3R0EB1	Zenner, RD3.0EB1
	MISCELLANEOUS	
SW701	4431-01048494	Push Switch, Cartridge

Ref. No.	Part No.	Description
	PCB-2 FUNCTION SWITCH P.C. BOARD	
SW801,802,803,804, 805	4431-05207247	Push Switch, Tape Monitor 1, Tape Monitor 2, AUX, Tuner, Phono
	PCB-3 INDICATION LAMP P.C. BOARD	
	CAPACITORS	
C12	5345-105-50	1μF, +75% −10%, 50V, Electrolytic
	TRANSISTORS	
Q801,802,803,804, 805	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), Switching
	DIODES	
D3	5685-S1WB10	Bridge Silicon, S1WB10
	MISCELLANEOUS	
PL801,802,803,804, 805,806	5731-1407154	Lamp, 36mA, 110V
	PCB-4 CAP. TRIM SWITCH P.C. BOARD	
SW601	4411-204713	Rotary Switch, Cap. Trim
C627,628	5353-680534	Capacitor, 68pF, ±5%, 500V, Mica
	PCB-5 TONE CONTROL P.C. BOARD	
	RESISTORS	
R12,18	5102-8204713	82 Ω, ±2%, 1/4W, Fuse
	CONTROLS	
VR501	5113-10482122	100 kΩ(C), Bass Control
VR502	5113-50383122	50 kΩ(C), Treble Control
VR503	5113-50381122	50 kΩ(M,N), Balance Control
	CAPACITORS	
C15,16	5345-476-25	47μF, +50% −10%, 25V, Electrolytic
C19,20	5345-107D041	100μF, +50% −10%, 25V, Electrolytic
C503,504	5345-226F0228	22μF, ±20%, 50V, Electrolytic
C509,510	5353-050934	5pF, ±0.5pF, 500V, Mica
C511,512	5345-336B0226	33μF, ±20%, 10V, Electrolytic
C513,514	5345-107F0228	100μF, ±20%, 50V, Electrolytic
C565,566	5345-226C0951	22μF, ±20%, 16V, Electrolytic
C567,568	5345-106C0951	10μF, ±20%, 16V, Electrolytic
C573,574	5345-107B0951	100μF, ±20%, 10V, Electrolytic
	TRANSISTORS	
Q3	5614-667(C)	2SD667(C), Voltage Regulator
Q4	5612-647(C)	2SB647(C), Voltage Regulator
Q501,502,503,504	5613-2320L(F)or(G)	2SC2320L(F) or 2SC2320L(G),
Q505,506,507,508, 509,510	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), } Flat/Tone Control Amp.
Q511,512	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F),
Q561,562,563,564	5613-2603(E)	2SC2603(E), Subsonic Filter, High-Cut Filter
	DIODES	
D6,7	5635-RD20EB1	Zener, RD20EB1
D801	5635-RD3R0EB1	Zener, RD3.0EB1
	MISCELLANEOUS	
SW502	4411-403711	Rotary Switch, Mode
SW503,504	4431-02087759	Push Switch, Subsonic, High Cut
SW505	4431-01028694	Push Switch, Loudness
SW806	4412-045732	Rotary Slide Switch, Tape Out
	PCB-6 VOLUME CONTROL P.C. BOARD	
VR504	5116-1047343	Variable Resistor, 100 kΩ(B), Volume Control

Ref. No.	Part No.	Description
PCB-7 POWER AMP. P.C. BOARD		
	RESISTORS	
R423,424	5174-681381	680 Ω, ±1%, 1/4W, Metal
R425,426	5174-470381	47 Ω, ±1%, 1/4W, Metal
R431,432	5174-243381	24 kΩ, ±1%, 1/4W, Metal
R433,434,439,440, 445,446,447,448, 453,454,455,456	5102-1014713	100 Ω ±2%, 1/4W, Fuse
R449,450	5102-8214713	820 Ω, ±2%, 1/4W, Fuse
R457,458,459,460	5102-1504713	15 Ω, ±2%, 1/4W, Fuse
R461,462,469,470	5102-2R2579	2.2 Ω, ±5%, 1/4W, Fuse
R471/473,472/474	5273-R22672	0.22 Ω, ±10%, 3W x 2, Cement (Special Dual)
R475,476	5175-220571	22 Ω, ±5%, 3W, Metal
R479,480	5171-270581	27 Ω, ±5%, 1W, Metal
R485,486	5102-3304713	33 Ω, ±2%, 1/4W, Fuse
	CONTROLS	
VR401,402	5101-10471913	100 kΩ (B)
VR403,404	5101-10271913	1 kΩ (B)
	CAPACITORS	
C6,7,8,9	5341-478F0051	4700μF, ±20%, 50V, Electrolytic
C21	5345-336C0211	33μF, ±20%, 16V, Electrolytic
C22	5345-107C0211	100μF, ±20%, 16V, Electrolytic
C401,402	5345-107F0228	100μF, ±20%, 50V, Electrolytic
C403,404	5353-820534	82pF, ±5%, 500V, Mica
C405,406	5345-474-50	0.47μF, +75% −10%, 50V, Electrolytic
C407,408	5345-226-16	22μF, +50% −10%, 16V, Electrolytic
C413,414	5353-050934	5pF, ±0.5pF, 500V, Mica
C421,422	5345-106F0226	10μF, ±20%, 50V, Electrolytic
	TRANSISTORS	
Q5,6	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), Audio Muting
Q401,402,403,404	5613-2240(BL)	2SC2240(BL),
Q405,406	5613-2603(F)	2SC2603(F),
Q407,408,411,412	5611-949(Y)	2SA949(Y),
Q409,410,413,414	5613-2229(Y)	2SC2229(Y),
Q415,416,423,424	5613-2235(O)	2SC2235(O), } Power Amp.
Q417,418	5613-945(K)	2SC945(K),
Q419,420,421,422	5611-965(O)	2SA965(O),
Q425,426	5613-2773(O)or(Y)	2SC2773(O) or 2SC2773(Y),
Q427,428	5611-1169(O)or(Y)	2SA1169(O) or 2SA1169(Y),
	DIODES	
D1,2	5685-S3WB20F4	Bridge Silicon, S3WB20
D8	5636-1S2471	1S2471
D9	5636-1S2472	1S2472
D10	5635-RD12EB2	Zener, RD12EB2
D401,402	5631-1S2473	1S2473
D403,404	5635-RD15EB2	Zener, RD15EB2
D405,406	5641-MV12YM	Varistor, MV12YM
D407,408,409,410	5632-ERB12-02	Zener, ERB12-02
	COILS	
L401,402,403,404	5597-35502	Ferrite Bead
L405,406	5991-7125	RF Choke
	MISCELLANEOUS	
CB401,402	4361-312014	Speaker Protector
	2132-291	Spacer, R475, R476
PCB-8 FUSE P.C. BOARD		
SW1	4431-01017358	Push Switch, Power
FU1	5732-402029	Fuse, 4A, 125V
FU2,3,4,5	5732-502029	Fuse, 5A, 125V
FU6	5732-401031	Fuse, 400mA, 125V
C1	5361-1030419	Capacitor, 0.01μF, +100% −0%, AC125V, Ceramic
	4472-7113	Fuse Holder, FU1∿5
	4472-7122	Fuse Holder, FU6

Ref. No.	Part No.	Description
	PCB-9 SPEAKERS AND TONE DEFEAT SWITCHES P.C. BOARD	
SW401,402	4431-02047451	Push Switch, Speakers 1, Speakers 2
SW501	4431-01047994	Push Switch, Tone Defeat
	PCB-10 HEADPHONES JACK P.C. BOARD	
R481,482	5171-471581	Resistor, 470 ohm, ±5%, 1W, Metal
J401	4451-00121	Jack, Headphones
	PCB-11 PIN JACK P.C. BOARD	
J801,802,803,804	4484-27	4-Pin Jack, Phono 1, Phono 2
J805,806,807,808, 809,810,811,812, 813,814,815,816	4486-8	6-Pin Jack, Tuner, AUX, Tape 1, Tape 2

PACKAGE